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A
TREATISE
ON
MEDICAL JURISPRUDENCE.

PART I.

COMPRISING THE CONSIDERATION OF
POISONS AND ASPHYXIA.

BY HENRY COLEY,

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“SI JUDICAS, COGNOSCE.”

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PREFACE.

IT will be in the recollection of the medical public, that a small work issued from the press some months ago, under the title, "Toxicologia, or A Treatise on Internal Poisons, in their relation to Medical Jurisprudence, Physiology, and the Practice of Physic," by W. F. LOWRIE, M. D. This publication was sanctioned by the recommendation of some of the most eminent physicians in the country, who were pleased to approve of its arrangement and subject matter. Its sale was, however, stopped, and under the following circumstances :

Towards the close of the year 1830, I had prepared two Toxicological Charts for publication ; one containing the description of the poisonous substances yielded from the mineral kingdom, either in a native condition or in a state of combination, and the other comprising the list of deleterious plants, and likewise the poisonous varieties of fish and insects that are apt to be mistaken for wholesome aliment. These charts were intended as the first of a series embracing the whole subject of Medical Jurisprudence ; but their publication was delayed, from an excess of literary engagements, many months after their completion. In the June or July following, an individual of the name of LOWRIE, a travelling map-seller, waited upon me for the purpose of disposing of a Grammatical Chart : his attention was attracted to the Toxicological Charts then suspended in my office, and he expressed some anxiety to learn their meaning and my designs respecting their publication : in several subsequent visits, made on the express subject of these charts, he demanded the price of their copy-right, or

upon what terms I would furnish him with a certain number of impressions, and eventually induced me to lend them for a few days, in order that he might ascertain the price of printing and paper in their publication. I was persuaded to this confidence by a hasty belief in his integrity, upon his solemn promise that no extracts should be made from the charts, and that they should not be shown to any party but his printer, and from his mention of several respectable individuals in New-York, whom he named as his friends and patrons. The charts were conveyed to his residence, 157 Washington-street, in this city, returned in about six or seven days' time, and with a refusal to purchase their right of publication.

From that time until January, 1832, when the work, "*Toxicologia*," appeared, no circumstances had transpired to render me aware that any improper use had been made of the charts in question; but, in examining that publication, and to which the name of Lowrie is attached, I immediately discovered that the whole of my materials had been pirated, my very language, even to some slight inaccuracies, copied, and, in fact, that the result of much labour and research was made serviceable in the perpetration of a fraud, by which I was deprived both of credit and emolument. The distinction of M. D. attached to the name of Lowrie, gave it a degree of respectability undeserved by the owner, and would, doubtless, have greatly contributed to the sale of his work, especially as he had obtained certificates of the most favourable nature from a number of Professors in the different colleges of the United States, approving of the general arrangement and plan of his undertaking.

It is due to the respectable publisher to state, that, upon a representation of the foregoing facts, he immediately stopped the sale of the book, refused any further connexion with the individual who had so grossly deceived the public through his instrumentality, and finally expressed his willingness to aid me in the publication of my own work, wherein I might have an opportunity of explaining the imposition.

The following pages form only the first part of a work intended as an outline of the whole science of Medical Jurisprudence ; in fact, they refer, in particular, to the materials surreptitiously made use of by the individual whose conduct has been described. The reason for this publication, in its present form, will be readily comprehended, as affording me the only chance of redeeming my literary property from invasion ; and the alteration in the arrangement, from a chart to a book, was in consequence necessarily forced upon me.

The subject of Asphyxia has been added to that of Poisons, from the connexion established, in some instances, between them, and from the wish to include, in one work, that portion of the whole subject more immediately falling within the province of the Chemist and the Pathologist.

Under the circumstances detailed, is this book submitted to the medical public, in the nature rather of an elementary treatise to a difficult although important science, than an elaborate disquisition on its subtleties. It may, perhaps, be regarded as a guide to, or a text book of Forensic Medicine, in which attention is directed to its prominent objects, and the mind of the youthful student in particular, attracted to its first principles.

The treatment of cases of poisoning, or asphyxia, demands the utmost promptness and decision ; life rapidly ebbs under the destructive influence of the one, or the controuling oppression of the other, and the delay of a few minutes too frequently renders the action of the most powerful agent inert. It is therefore of essential importance, that the skill of the physician should be immediately manifested in the application of suitable remedies, and that his mind should be prepared for the detection of the poisonous material, in order to oppose it by its proper and if possible, by its specific antidote.

A reference to the ensuing pages will impart this necessary information, and likewise teach the practitioner to discriminate between the various symptoms occasioned by different poisons.

The directions on the subject of Tests, are sufficiently minute

to assist the practitioner in discovering the nature of the poison, particularly when confirmed by the morbid appearance of the viscera.

The second part of this work, treating of Infanticide, Murder by Weapons, Rape, Gestation, and Insanity, will appear in the course of a few months.

HENRY COLEY,
152 Greenwich-street, New-York.

November 1, 1832.

INTRODUCTION.

THE science of Medical Jurisprudence is closely allied to the legitimate and successful practice of medicine, and, in its application, it is not less related to the interests of mankind at large.

Embracing a variety of considerations affecting life as well as property, this science demands of the Medical Faculty, to whom its exercise is entrusted, the closest habits of attention, investigation, and comparison. The great gift of life bestowed by the Creator, is too often suddenly terminated by the stroke of disease, the hand of violence, or the subtle poison; circumstances may arise sufficient to point suspicion, and the physician is summoned to determine by what event death has been occasioned. One unit is lost to society, and the public voice demands a strict account of the forfeiture; another life may be at stake upon a charge of murder, and the same authority claims its acquittal or condemnation. The fiat rests with the physician, to whom the task is committed of unravelling the evidence so far as it relates to the examination of the deceased, and his words may restore the accused to his accustomed place in society, or consign him to the scaffold.

The various agencies by which crime affects its purpose in destruction, are often of difficult detection: a fall, for instance, in a state of intemperance, may occasion a wound on the head somewhat similar to one inflicted by a weapon; and, on the other hand, the mark from a weapon, although fatal under peculiar circumstances, may be too indistinct to render decisive evidence. The pathological characters may be equally undecisive; for the blush of inflammation can be traced to a slight as well to as a severe injury, and the probability of apoplexy in some individuals, from a constitutional cause, assists in throwing a doubt over the investi-

gation exceedingly difficult to relieve. This is one of the many instances in which the judgment may be arrested, if not confused, as far as injury, or the suspicion of an injury, is concerned. the same uncertainty prevails in other enquiries, particularly in that of Infanticide : the readiness with which life can be destroyed, at its earliest period, renders the commission of this act a ready means for hiding the crime of incontinence, and of avoiding the censure attached to one fault, by the perpetration of another of a deeper dye. Not unfrequently, however, has it happened, that the unfortunate one who has been lured to error, incurs suspicion from the circumstance of having concealed her shame, when in the solitary hour of trial its object expired from want of necessary care. Here is the physician's opinion anxiously demanded, and not only on the question whether life had a commencement, but on the more difficult subject, whether violence, in any form, had been attempted, by which existence was prevented or destroyed.

Asphyxia is a condition under which life departs its tenement, imposing an anxious duty upon the physician in pronouncing how far accident or design may have operated in an exposure of the sufferer to situations or circumstances inducing it. There may be no direct evidence to prove the intention of the suicide—no testimony to warrant the belief that violence has been committed—and the opinion may incline to accident as the cause of the misfortune ; when an apparently unimportant circumstance relative to the habits of the deceased, or to the past conduct of another individual, may attach a new character to the investigation, and eventually detect the criminal.

Death by Poison has too frequently occurred in every country, not to have received its share of observation in the study of Forensic Medicine. The subject is so extensive—it admits of such a variety of considerations in a moral, anatomical, chemical, and pathological point of view, that the exertions of science are almost irresistibly devoted to its elucidation, and the attention even of the young mind is attracted by the enticing display of experiment wherewith its study is accompanied. When we consider

how fertile the animal and vegetable kingdoms are in deleterious substances; how suddenly the life of man is terminated by the administration of some, and how slowly others are fatal; when we reflect upon their various modes of action upon the animal economy, (some applied directly to the mucous surfaces of the intestines, others through the medium of the circulation to the vital powers, a third class interfering with the nervous system, and a fourth attacking a portion of the respiratory apparatus by spastic contractions) and when we regard the several appearances presented by different tissues under the action of poison, and the diversity of symptoms occasioned, we may well admit that the utmost care and ingenuity are required in adequately performing the office of examiner and reporter upon circumstances of so varied a character.

The questions implicated in a charge of Rape, are often extremely intricate, requiring an abundant caution in their solution by the medical jurist; when the crime is perpetrated upon an individual of tender years, a decision is readily made; but, in after life, there are doubts which can only be relieved by concurrent evidence and the testimony of the injured party, whose general manners and recital of the events as they occurred, will confirm or stagger his belief in her statement.

Insanity is a subject of important reference, both as respects the condition of the individual, and the interest of society. Liberty of person, as the birthright of man, may, in no instance, be interfered with upon slight pretences; nor may an individual be deprived of the controul of his property without an obvious necessity, arising from mental imbecility, inconsistency, or violence, which incapacitates him from its rational use, and, in fact, enables him to outrage the feelings and institutions of the community. But there are a number of grades in Insanity, from the merest weakness of intellect to the most savage madness; the former may hardly justify the transfer of rights or the restriction of person, whilst the latter demands exclusion from the world, and frequently the exercise of force and severity. The physician

is here summoned to mark the mental character—to judge of its fitness or inability to correspond with the circumstances of society, and frequently to detect the lunatic under the mask of cunning, or in the disguise of eccentricity : the freedom of a fellow creature rests upon his decision !

Gestation is another subject bearing strongly upon the rights of the individual, and the welfare of society at large. The natural term of pregnancy is subject to some varieties, which have occasionally been rendered more remarkable, and in consequence the fair fame of woman has been tarnished by unmerited suspicion, and the inheritance of a child wrested from his grasp. It is the duty of the physician to separate the truth or the probability from the fiction in such cases, to bring the weight of his experience and knowledge into the scale, and determine according to the laws of Nature and by the rules of Science, how far the assumption, sought to be established, is correct.

Such are the principal subjects comprised in the study of Medical Jurisprudence, and to which the attention of the physician is called in determining the doubts wherewith their consideration is enveloped. Placed in the jury-box, he is frequently the most important witness, and directs the verdict by the nature of his evidence, whether it be applied in a question of life or death, or to one simply affecting the custody or inheritance of property. We are aware how often the medical testimony is attempted to be shaken in cross-examination, and we have unfortunately been witnesses of the want of sufficient skill and tact displayed by some practitioners in their replies to an opposing counsel. Unless the mind be well made up by repeated study and investigation upon the abstruse points connected with Forensic Medicine, the ingenuity of the lawyer will involve the physician in a mass of contradictory statements ; he will be betrayed into an inconsistency of reply to the most simple query, and defeat the very end for which he has been summoned to appear.

The physician therefore needs all the aid that the collateral sciences can afford to medicine, before he can become an adept in

Medical Jurisprudence. From Anatomy, he derives a knowledge of the relative situation of parts, and how far and in what manner they are likely to be injured by direct or indirect violence; from Physiology, he is enabled to decide how far the functions of respiration, circulation, and secretion, have been affected, or whether their arrest was occasioned through the instrumentality of disease or by the hand of man; by Pathology, he is instructed how to discriminate between the healthy and morbid conditions of each portion of the animal economy, and to judge of what the distinctive characters to which his attention may be directed, are the result; and by Chemistry, he is taught how to analyze the contents of the cavities, to remove the disguise from poisonous substances, and test their exact qualities. Fortified with the necessary degree of knowledge from such sources, the physician multiplies his usefulness, and ranks not only as the preserver of health, but as a moral agent to society in the detection of crime, and in the rescue of innocence from suspicion and unmerited punishment.

The following pages are devoted to the consideration of two important branches of the science of Medical Jurisprudence—*Poisons* and *Asphyxia*. These subjects have been chosen, both for the reason stated in the preface, and for their intrinsic importance, as an appropriate commencement for this work; the study of each is beset with difficulties, which a close attention can alone remove, and which can scarcely be denied where their consequences both in a medical and public light are remembered.

POISONS.

“The action of *Poisons*,” says Dr. CHRISTISON, in his invaluable *Treatise on Poisons*, “may be considered as *Local* and *Remote*.”

The effects of the first are of three kinds; some decompose chemically, or corrode the part to which they are applied; others, without immediately injuring its organization, inflame or irritate it; and a third variety neither corrode nor irritate, but make a peculiar impression on the sentient extremities of the nerves, unaccompanied

by any visible change of structure. The two first of these species of poisons may take place in any tissue or organ, on the skin, the mucous membrane of the stomach, intestines, windpipe, air-tubes, bladder, and vagina, in the cellular tissue, in the serous membranes of the chest and abdomen, and in the nervous fibre. As to the third variety, we are not well acquainted with the nature of local nervous impressions on different tissues, and in some textures they are probably very indistinct.

The remote action of poisons displays peculiar phenomena; the affected part sometimes recovers without any visible change; sometimes undergoes the usual process consequent on inflammation; sometimes perishes at once, and is thrown off; and if the organ be one, the function of which is necessary to life, death may gradually ensue in consequence of that function being irrevocably injured.

The influence of a poison is conveyed from one organ to another in two ways; either the local impression passes along the nerves to the organ secondarily affected, or the poison enters the bibulous vessels, mingles with the blood, and passes through the medium of the circulation. In the former way poisons are said to act through *Sympathy*, and the latter through *Absorption*.

Notwithstanding the discoveries and the theory of MAJENDIE, in venous absorption, it is probable that some poisons act by sympathy without entering the blood, their operation consisting of an impression made on the sentient extremities of the nerves, and conveyed thence along their filaments to the brain or other organs.

That poisons act by absorption, is still more evident; first, they disappear during life from the shut cavities into which they have been introduced; secondly, many poisons will act with unimpaired rapidity, when the nerves supplying the part have been divided, or even when the part is attached to the body by arteries and veins only, as proved by the experiments of MUNRO in regard to opium, MAJENDIE to nux vomica, COULLON to hydrocyanic acid, and COINDEL and CRISTISON to oxalic acid; thirdly, some poisons act with a force proportional to the absorbing power of the tex-

ture with which they are placed in contact : thus, the most rapid channel of absorption is by a wound, or by express injection into a vein ; the surface of the serous is a less rapid medium, and the mucous membrane of the alimentary canal is still less so. Poisons have been detected not only in the blood, but in the secretions and excretions, as proved by the reports of a number of writers upon this subject ; it must, however, be a rare circumstance to find any deleterious material in that fluid or in the animal solids, and for the following reasons : The quantity administered of a subtle poison, and the still less quantity entering the blood-vessels, will nearly always be too small after being distributed throughout the body ; the poison may be partly or wholly removed before death beyond the reach of analysis, from having passed off with the excretions ; many poisons are probably decomposed in the blood without that fluid undergoing any important change, and oxalic acid in particular presents an instance of such decomposition being affected. We may not, therefore, under these circumstances, feel surprised at the frequent failure of chemical analysis to detect in the blood or secretions the presence of poisons that have undoubtedly been swallowed.

We may now examine the numerous bodies which rank as Poisons, taken from the animal, vegetable, and mineral kingdoms. The following list exhibits them arranged under the heads of their respective qualities, as developed in their operation upon the animal economy :

CLASSIFICATION OF POISONS BY FODERÉ AND ORFILA.

CLASS I.

CORROSIVE OR ESCHAROTIC POISONS.

Arsenical Preparations.

Arsenious acid, or white oxide of arsenic.

The arsenites.

Black oxide of arsenic, fly-powder.

Arsenic acid.

Arseniates of potash, soda, and ammonia.

Yellow and red sulphurets of arsenic.

Mercurial Preparations.

Corrosive sublimate.

Nitrate of mercury.

Red precipitate.

Red oxide of mercury, (precipitate *per se*.)

Sulphate of mercury, (turbitb mineral.)
 White precipitate.
 Mercurial vapours.
Antimonial preparations.
 Oxide of antimony.
 Tartar emetic.
 Antimonial wine.
 Muriate of antimony.
 Kermes mineral beyond medical doses.
 Golden sulphur of antimony do.
 Cinnabar of antimony, &c.
 Antimonial vapours.
Copper.
 Oxide of copper.
 Sulphate of copper.
 Nitrate of copper.
 Muriate of copper.
 Acetate of copper.
 Ammoniacal copper.
 Coppery soaps.
 Coppery wine.
Silver.
 Nitrate of silver.
Gold.
 Muriate of gold.
 Fulminating gold.
Zinc.
 Oxide of zinc.
 Sulphate of zinc.
Bismuth.
 Nitrate of bismuth.
 Sub-nitrate of bismuth.
Tin.
 Muriate of tin.
 Oxides of tin.
Acids, concentrated and in particular.
 Sulphuric acid.
 Nitric acid.
 Muriatic acid.
 Phosphoric acid.
 Fluid nitrous acid.
 Sulphureous acid.
 Fluoric acid.
 Phosphorous acid.
 Oxalic acid.

Tartaric acid.
Alkalies, caustic.
 Potash.
 Soda.
 Ammonia.
Alkaline carbonates in large doses.
Caustic Alkaline earths.
 Barytes, and its salts.
 Quick-lime.
 Phosphorous.
 Glass and enamel in powder.
 Cantharides.
 Iodine.
 Hydrogenated sulphate of potash.

CLASS II.

ASTRINGENT POISONS.

Lead.
 Acetate of lead.
 Carbonate of lead, cerusse.
 Litharge.
 Wines and water impregnated with lead.
 Food cooked in leaden vessels.
 Syrups and spirits clarified with acetate of lead.
 Saturnine emanations.

CLASS III.

ACRID POISONS.

Chlorine.
 Fluid Chlorine,
 Nitrous acid gas.
 Sulphureous acid gas.
 Nitrate of potash.
 Veratrum album, white hellebore.

ACID POISONS.

Helleborus niger, black hellebore.
 Bryonia Dioica.
 Elaterium.
 Colocynth.
 Gamboge.
 Daphne gnidium, spurge flax.
 Daphne mezereum, &c.
 Ricinus communis.
 Euphorbia officinarum, and several other species.
 Savine.

Rhus radicans.
Rhus toxicodendron.
Rhus vermix.
Anemone pulsatilla, &c.
Aconitum napellus, &c.
Chelidonium majus.
Delphinium staphysagria.
Narcissus pseudo-narcissus.
Ceanothus crocata.
Gratiola officinalis.
Jatropha curcas.
Scilla maritima.
Sedum acre.
Ranunculus flammula, and several
other species.
Rhododendron chrysanthum.
Fritillaria, imperialis.
Pedicularis palustris.
Cyclamen Europæum
Plumbago Europæa.
Colchicum autumnale.
Scammony.
Cynanchum erectum.
Lobelia syphilitica.
Apocynum androsæmifolium, and
other species.
Asclepias gigantea:
Hydrocotyle vulgaris.
Clematis vitalba, &c.
Pastinaca sativa annosa.
Sclanthus quadragonus, and other
species.
Phytolacca decandra.
Croton tiglium.
Arum maculatum, and other species.
Calla palustris.

CLASS IV.

NARCOTIC POISONS.

Opium.
Hyoscyamus niger.
Hyoscyamus albus, &c.
Prussic acid.
Prunus lara cerasus.
Oil of laurel.
Bitter almonds.

Lactuca virosa.
The solana.
Taxus baccata.
Actæa spicata.
Physalis somnifera.
Azalea pontica.
Ervum ervilia.
Lathyrus cicera.
Paris quadrifolia.
Nitrogen gas.
Nitrous oxide.

CLASS V.

NARCOTICO-ACRID.

Atropa bella-donna.
Datura stramonium, &c.
Tobacco.
Digitalis purpurea.
Anagallis arvensis.
Aristolochia clematitis.
Conium maculatum.
Cicuta virosa.
Æthusa cynapium.
Ruta graveolens.
Nerium oleander.
Upas tiento.
Nux vomica.
Bean of St. Ignatius.
Angustura pseudo-ferruginea.
Upas antiar.
Ticunas.
Woorara.
Camphor.
Cocculus indicus.
Poisonous mushrooms.
Alcohol.
Sulphuric æther.
Carbonic acid gas.
Gaseous oxide of carbon.
Ergot, spurred rye.
Lolium temulentum.
Hippomane mancinella.
Mercurialis perennis.
Chærophyllum sylvestre.
Sium latifolium.
Coriaria myrtifolia.
Odours of the above plants.

CLASS VI.

SEPTIC OR PUTRIFYING POISONS.

Sulphuretted hydrogen gas.
Putrefied substances.
Viper.
Venomous snakes.

Scorpion.
Tarantula.
Sting of bees, wasps, &c.
Poisonous fishes.
Muscles.
Malignant pustule.
Rabies.

The arrangement proposed by ORFILA,* divides Poisons into four classes; the *Irritants*, *Narcotics*, *Narcotico-Acrids*, and *Septics* or *Putrefiants*.

The *Irritants* include all poisons whose sole or predominating symptoms are those of irritation or inflammation; the *Narcotics* those which produce stupor, delirium, and other affections of the brain and nervous system; the *Narcotico-Acrids* those which cause sometimes irritation, sometimes stupor, and sometimes both together; whilst the *Septics* are those which give rise to putrefaction in the living body. Dr. CHRISTISON reasonably objects to the retention of such a class of poisons as Putrefiants, in this arrangement, as no substance, however deleterious, can cause putrefaction in the living body; and therefore he discards the class from his admirable work, including all poisons under the three heads of *Irritants*, *Narcotics*, and *Narcotico-Acrids*.

Dr. PARIS has proposed the following arrangement of poisonous substances:

CLASS I. Poisons which act primarily through the medium of the nerves, without being absorbed, or exciting local inflammation.

Order 1st. *By which the function of the nervous system is suspended or destroyed.*

(DEATH BY SUFFOCATION FROM PARALYSIS OF THE RESPIRATORY MUSCLES.)

Alcohol	Essential oil of	Opium†
Aconite	almonds†	Salts of lead
Oil of Tobacco	Camphor†	Croton Tiglium†

* See the "Outlines of his Course of Legal Medicine," published in 1821, and his "Essay on the Treatment of Poisoning and Asphyxia," being a modification of the arrangement proposed by Foderé in the second edition of his great work on Medical Jurisprudence.

Order 2d. By which the heart is rendered insensible to the stimulus of blood.

(DEATH BY SYNCOPE.)

Infusion of tobacco,

Upas antiar.

CLASS II. Poisons, which, by entering the circulation, act through that medium, with different degrees of energy, on the heart, brain, and alimentary canal.

(DEATH IN MANY FORMS.)

Arsenic,	Hellebore,	Squill,	Prussic acid.
Emetic tartar	Savine,	Opium,†	Deadly nightshade,‡
Muriate of barytes,	Meadow saffron,	Lettuce,	Hemlock,
		Henbane,	Coculus Indicus.

CLASS III. Poisons, which, through the medium of circulation, expend their energies upon the spinal marrow, without directly involving the functions of the brain.

(DEATH BY TETANIC CONVULSIONS.)

Nux vomica, and the whole tribe of strychnus.

CLASS IV. Poisons which produce a direct local action on the mucous membrane of the alimentary canal.

(DEATH BY GANGRENE.)

Corrosive sublimate,†	Cantharides,
Verdigrease,	Bryony,
Muriatic acid,	Elaterium,
Oxide of tin,	Euphorbium,
Sulphate of zinc,	Colocynth,
Nitrate of silver,	Hedge hyssop,
Concentrated acids,	Ranunculi,
Caustic alkalies,	Nitre.

† This substance may also act by being absorbed.

‡ This article has also a local action.

The organs not immediately necessary to life, may also be acted upon in a greater or less degree by poisons; thus, arsenic inflames the alimentary mucous membrane; mercury, the salivary glands and mouth; cantharides, the urinary organs; chromate of potass, the conjuncion of the eye; and maganese, the liver; iodine acts on the lymphatic glands, and ergot of rye causes gangrene of the extremities.

Although it may occasionally happen, that one organ is alone affected by a particular poison, the rest of the economy remaining undisturbed, it more frequently occurs, that, in addition to the direct influence upon one function, other organs are indirectly affected. "Oxalic acid, for instance, irritates and inflames the stomach directly, and acts indirectly on the brain, the spine, and the heart. A large dose causes sudden death by paralyzing the heart; if the dose be somewhat less, the leading symptom is violent tetanic spasm, indicating an action upon the spine, and death takes place during a paroxysm, the heart continuing to contract for some time; if the dose be still less, the spasms, at first distinct, become by degrees, fainter and fainter, while the sensibility in the intervals, at first unimpaired, becomes gradually clouded, till at length pure coma is formed without convulsions, thus indicating an action on the brain. Arsenic has the power of acting on the brain, heart, and lungs; the lining membrane of the nostrils and eyelids; and the kidney, bladder, and vagina."

In the treatment of cases of poisoning, the physician may have one of three objects in view; firstly, its sudden removal either from the stomach or through the bowels; secondly, the alteration of its chemical nature before it comes within the sphere of its action; and thirdly, the controul of its poisonous action after it has commenced, by the excitement of a contrary action in the system.

The first indication is easily accomplished, when it is possible to excite either emesis or catharsis, by the ready administration of appropriate medicines; the second is affected in several ways, according to the mode of action of the poison for which they are given: thus, if a pure corrosive, such as a mineral acid, have

been swallowed, the exhibition of an alkali or earth will neutralize it, and destroy, or at least materially lessen its poisonous properties ; but, should the poison, independent of its local effect, act remotely by an impression on the inner coat of the vessels, mere neutralization of its chemical properties is not sufficient ; it is necessary that the antidote should render the poison insoluble, or nearly so, and that not only in water, but likewise in the animal fluids, more particularly the juices of the stomach.

The third description of antidote operates by exciting a contrary action to that established by the poison ; but, as it is difficult to say what is the essence of a contrary action, and as we are unacquainted with any mode of inducing any action counter to nearly the whole of the irritant class of poisons, we can seldom apply this mode in treatment with any great prospect of success. The remote operation of lead may certainly be corrected by mercury given to salivation, and again the sialogogue property of mercury may be relieved by nauseating doses of antimony. Ammonia is, to a certain extent, an antidote for prussic acid, by its stimulating effects as opposed to the sedative ones of the poison ; but the whole of this reasoning is too vague to place any reliance upon. It is, in fact, among the changes induced by chemical affinities, that we must look for counter-poisons ; thus, magnesia or chalk is a complete antidote for the mineral and oxalic acids, albumen for corrosive sublimate, barytes for tartar emetic, common salt for lunar caustic, sulphate of soda or magnesia for sugar of lead, and muriate of barytes, vinegar or oil, for the fixed alkalies ; and these substances all act, either by neutralizing the corrosive power of the poison, or by forming with it an insoluble compound.

Poisons act with various degrees of intensity, some proving fatal instantaneously, and others being slow, or rather imperceptible, in their effects. The more violent may, however, be so administered as to require a considerable time in their perfect development upon the system ; thus, arsenic in small doses will occasion but slight nausea and general weakness ; corrosive subli-

mate only occasion salivation ; and digitalis and unx vomica produce but a moderately sedative effect : if the doses be increased, the consequences are proportionably rapid and violent ; and in all these substances, such a quantity may be administered, as to induce a fatal result in a very short space of time.

The peculiar sympathy, both primary and secondary, following the exhibition of each poison, will be found under the proper heads in the ensuing pages, as well as the morbid appearances presented upon a *post mortem* examination ; and these added to the tests and chemical analyses of the substances found in the cavities, are the evidences submitted to the medical jurist, whereon he is to found his opinion upon the nature of the case in all its bearings, submitted to his decision.

It was thought proper to describe each article under its chemical property and its medical value, with a short description of the general mode of its preparation, and its most obvious characters, in order, that its use might be contrasted with its abuse, and that its appearance might become familiar to the eye of the practitioner.

The Remedies and the Rationale for their employment, are founded partly from the best authorities who have written on the subject, and partly from observation, and it has been the aim of the Author to render them as clear and as explicit as possible.

The notice of *Asphyxia* includes the consideration of *Submersion*, *Suspension*, *Inhalation of Unrespirable Gases*, *Cold*, and *Electricity*, and describes the mode in which the functions of life are arrested, and the peculiarity of the agency, as well as the necessary treatment to be adopted for the recal of the sufferer to consciousness.

METALLIC POISONS.

SILVER.

THIS metal affords but one preparation for the service of medicine, or that can with any degree of probability be converted into a poison, — *The Nitrate of Silver*, (*Nitras Argenti*) or *Lunar Caustic*, a salt formed by the action of nitric acid upon the metal.

Preparation. Pure nitric acid, diluted with an equal weight of distilled water, is poured upon metallic silver; the solution, when saturated, deposits its crystals as it cools, and likewise upon its evaporation. This method of procuring the salt is unnecessary, when the lunar caustic of medicine is simply required; the solution of silver may at once be evaporated to dryness, gently fused, and run into cylindrical moulds.

Chemical Composition, Character, &c. In its crystallized state, it consists of 64 parts of the oxide of silver, 22 of nitric acid, and 14 of water; when fused, of 70 parts of oxide of silver, and 30 of nitric acid.

The crystals are transparent and colourless; primary form, a right rhombic prism. The fused nitrate presents the appearance of a dark grey cylinder, of an irradiated structure when fractured.

Soluble in an equal weight of water at 60. Alcohol is also its ready solvent.

Taste, intensely bitter and metallic: *odour*, none.

Medical Use and Dose. Internally, tonic and antispasmodic, in the quantity of one eighth of a grain to a grain, gradually increased to gr. iij or iv, in pill; administered in obstinate cases of chorea and epilepsy, and occasionally in dyspeptic complaints. Externally it is applied as an escharotic, both in substance and solution, to cancerous and other sores, and as a stimulant to venereal and indolent ulcers.

Symptoms when taken in excess. *Primary*—Corrosive and acrid taste in the mouth and throat, with sensation of fulness and choking; great anxiety, and severe pain in the region of the stomach. *Secondary*—Vomiting; diarrhœa; pulse quick and small; syncope; cramps; small quantities of blood mixed with frothy mucus discharged from the stomach; tenesmus; convulsions; death.

Cause of Death. Inflammation and gangrene of the mucous membrane of the stomach and intestines from the direct local action of the poison.*

Morbid Appearances. The larynx is usually discovered in a state of extreme vascularity: the mucous coat of the stomach and intestines studded with inflammatory patches, with some portions eroded, or covered with dark and gangrenous spots.

Remedies. Copious draughts of salt and water; and in a few minutes afterwards, 30 or 40 grains of Ipecacuanha, or from 10 to 20 grains of sulphate of zinc as an emetic.

When the vomiting has ceased, but the pain and the cramps continue, and in particular, when there is a tendency to convulsions, venesection must be promptly resorted to, fomentations applied to the abdomen, an emollient injection administered, and, if practicable, the tepid bath employed.

Rationale in the Employment of Remedies. Muriate of soda is the true antidote to the nitrate of silver, so completely decomposing it, that if its saturated solution be filtered through common salt, it may afterwards be drank with impunity. The use of the emetic is obvious, and the subsequent treatment will tend to subdue the inflammatory symptoms not previously relieved.

Tests. Collect and strain the contents of the stomach. If the poison have been swallowed in an aqueous solution, the addition of a small quantity of the oxide of arsenic will throw down a yellow precipitate, which is an arseniate of silver. The fixed alkalies, potass and soda, effect an immediate precipitation of the salt, which remains undisturbed in its solution by the addition of ammonia. The muriates of alkalies, earths, and metals, decompose the nitrate of silver, precipitating a white powder, which turns black very shortly after exposure to the light.

A stick of phosphorus, dipped into a mixture containing the poison, will separate and precipitate the silver in a metallic state.

The sulphuric and tartaric acids, with their salts, the hydro-sulphurets generally, and astringent vegetable infusions, will likewise decompose this poison; but the tests already enumerated are sufficient for its detection.

* The basis of this salt is occasionally absorbed, for there are several cases on record, in which the oxide of silver has been deposited in the rete mucosum, and given a purple hue of a very singular appearance to the patient. (Paris.)

MERCURY.

This metal, so essentially serviceable in its preparations, yields a salt of the most destructive power when taken in excess—*The Bi-chloride of Mercury*, commonly known by the name of *Corrosive Sublimate*, and formerly designated by Chemists, as *the Oxy-muriate of Mercury*.

Preparation. Two pounds of mercury are boiled with two and a half pounds of sulphuric acid to dryness in a glass vessel, heated by a sand-bath. When the mass is cold, it is mixed with four pounds of common salt (well dried) and exposed in an earthen vessel to a heat gradually raised. The bi-chloride is sublimed, and condenses in very small prismatic crystals.

Chem. Comp. Character, &c. The salt consists of one proportional of mercury, to two proportionals of chlorine; or, according to Sir Humphrey Davy, who regarded it as a per-chloride, of 74 parts of mercury and 26 of chlorine. When pulverized and thrown upon coals, it is immediately volatilized, giving out a thick white smoke of a pungent odour, and exceedingly irritable to the mucous membrane of the nose and fauces if inhaled. The crystals become opaque on exposure to the air.

Specific gravity, 5.1398.

Soluble in eleven parts of cold, and in three of boiling water; likewise soluble in ether, the muriatic, sulphuric, and nitric acids.

Taste, very acrid and astringent: *odour*, none.*

Med. Use and Dose. Internally, stimulant, and anti-syphilitic in doses of from $\frac{1}{8}$ to $\frac{1}{2}$ a grain, principally administered in secondary syphilis, and obstinate cutaneous eruptions; externally, it is employed for the same purposes, in the proportion of two to four grains to a pint of water.

Primary Symptoms. Burning and metallic taste in the mouth; great oppression in the throat, with difficulty of swallowing; anxiety; acute pain in the stomach and bowels. *Secondary*—Frequent and

* The similarity of the terms in general use for the bi-chloride (*corrosive sublimate*,) and the pro-chloride of mercury (*calomel*,) renders it necessary to point out their distinguishing character. Calomel is mild and insipid to the taste, insoluble in water, and affording a black precipitate on being added to lime-water. Corrosive sublimate has a very styptic and metallic taste, is soluble in water, and yields a yellow precipitate with lime-water.

Brugnattelli (see *Annales de Chimie et Physique*, t. iv. p. 334,) proposes the following method of distinguishing *corrosive sublimate* from *arsenic*:—Take a quantity of fresh wheat starch, mix it with water, and add a sufficient quantity of *iodine* to give the liquid a blue colour; if corrosive sublimate or arsenic be added to this liquor, the colour is alike destroyed, and it becomes reddish; when if the change have been effected by the latter substance, a few drops of sulphuric acid will restore the blue colour; but if by the former, the acid will occasion no alteration.

violent vomiting ; quick and hard pulse ; diarrhœa ; copious salivation ; great debility and difficult respiration ; tremors ; convulsions ; death.

Cause of Death. Inflammation and gangrene of the mucous membrane of the stomach and intestines. Corrosive sublimate is also capable of being received into the system, and thus destroying life ; but its primary effect is usually too quickly destructive to permit its absorption.

Morbid Appearances. The mucous membrane of the stomach and intestines are in a state of gangrene, with frequent perforation of their coats : the œsophagus and the first portion of the duodenum constricted, the pylorus highly inflamed, and the whole of the intestinal canal in a condition of extreme vascularity.

Remedies. Give large quantities of white of egg with water, and copious draughts of warm water afterwards, or where the first cannot be procured, repeated draughts of wheat flour and water may be administered. When the more acute symptoms are subdued, fomentations may be applied to the abdomen, and venesection practised, especially if the pulse continue quick and hard.

Rationale. The albumen of the egg decomposes the bi-chloride, reducing it to the state of a pro-chloride, or calomel, which may either pass off by the bowels, or be evacuated from the stomach. Recent experiments have proved that vegetable gluten, as existing in wheat flour, decomposes this poison in the same manner as albumen.—(Paris.)

Tests. Collect and dry the white sediment that may be found in the stomach or intestines, mix it with three times its weight of black flux, and introduce it into a dry thin glass tube, stopping the open mouth of the tube, loosely, with paper ; expose the closed end to the heat of a spirit lamp, and, if present, the sublimate will rise to the top, lining the inside of the tube with a shining metallic crust. Add to a watery solution of the powder, found as above, a small quantity of lime-water, and an orange-coloured precipitate will be the immediate result. One drop of a solution of the carbonate of potass will occasion a white precipitate, and a farther addition, one of an orange-colour. A stream of sulphuretted hydrogen gas will give a dark coloured precipitate.* Place a small quantity of the suspected solution on a plate of glass, and near it a similar quantity of sulphuric acid (diluted with five times its weight of distilled water,) bend a piece of zinc or iron wire in the form of the Greek letter Π , tying the ends to a gold ring ; then bring the wire into contact with the acid, and the ring with the solution, and if the smallest quantity of the corrosive sublimate be present, the ring will be immediately covered, at that part touching the solution, with mercury. If a solution of the salt be placed on a small sheet of gold, with a drop of muriatic acid,

* Sulphuretted hydrogen gas is readily procured for this purpose, by treating the sulphuret of antimony with dilute muriatic acid.

and a piece of tin, the mercurial compound will be decomposed, and the mercury will amalgamate with the gold. If the sublimate have been taken in wine, coffee, or any coloured fluid, shake it slowly in a phial for ten minutes with 3 drachms of sulphuric ether; pour off the ether after the fluid is separated by rest, and evaporate the residue, when the sublimate will remain in a solid form, which may be exposed to the above tests. Where no powder can be obtained, only a small quantity of water should be used in washing the contents of the stomach, as the sublimate would be readily dissolved by an excess.

COPPER.

This metal is incapable of exercising any deleterious effects upon the animal system in an uncombined state; its preparations, however, are highly poisonous, although valuable agents in the practice of medicine. Three salts may be named; *the Sulphate of Copper* (*Sulphas Cupri*) or *Blue Vitriol*; *Ammoniated Copper* (*Cuprum Ammoniatum*;) and *the Sub-Acetate of Copper* (*Sub-Acetas Cupri*) or *Verdigrase*.

Preparation. The native sulphuret of copper is exposed to air and moisture, by which oxygen is absorbed, the copper oxidated, and the sulphur converted into sulphuric acid.

Chem. Comp. Character, &c. 1st. *The Sulphate of Copper* is, properly speaking, an oxy-sulphate, consisting of one proportional of peroxide, two proportionals of sulphuric acid, and, when crystallized, ten of water, from which last ingredient its beautiful colour is derived.* The crystals are rhomboidal prisms, of a deep blue colour. Specific gravity, 2.23 (Kirwan), or 1.150 at 42° (Watson).

Soluble in four parts of water at 60°, and in less than two at 212°. Insoluble in alcohol. *Taste*, harsh, acrid, and astringent: *odour*, none.

Medical Use, &c. Internally, tonic and emetic; to answer the former indication, in doses of $\frac{1}{4}$ of a grain, and the latter from ij to xv; its use in epilepsy, hysteria, intermittent fever, &c., has gradually declined, and it is now seldom employed except as an immediate emetic in cases of poisoning from other substances. Externally, it is used as an escharotic, both in substance and solution, to foul and indolent ulcers, and to repress granulations. A weak solution is likewise sometimes recommended as a collyrium, and also as an injection in obstinate gleet.

* According to Proust, this salt is composed of

Copper,	25.6	} forming black oxide	32
Oxygen,	6.4		
Sulphuric Acid,			32
Water,			36
			<hr/> 100

2d. *Ammoniated Copper.* *Preparation*—Obtained by rubbing two parts of the sulphate of copper with three of the carbonate of ammonia; the carbonic acid of the latter being disengaged, while the ammonia combines with the sulphate.

Chem. Comp. Character, &c. This is a triple salt, a sub-sulphate of oxide of copper and ammonia, in the form of a violet-coloured mass, which becomes green on exposure to the air. *Soluble* in 24 times its weight of water: *taste*, acrid and metallic: *odour*, ammoniacal.

Medical Use, &c. Internally, tonic and antispasmodic, in doses of $\frac{1}{4}$ of a grain cautiously increased to grains v, twice a day: administered with advantage in epilepsy, and occasionally in chorea, hysteria, and intermittent fever. Externally, it is employed in the form of solution, as a stimulant to foul ulcers, &c.

3d. *Sub-Acetate of Copper.* *Preparation.* The verdigris of commerce is formed by exposing sheets of copper to the continued influence of the fumes of acetic acid.

Chem. Comp. Character, &c. This salt consists of 43 parts of acetate of copper, 27 of black oxide of copper, and 30 of water; (Proust) and presents the appearance of minute crystals of a bluish green hue. *Taste*, styptic and metallic: *odour*, none.

Medical Use, &c.—Not employed internally. Externally, it is applied in solution to the callous edges of ulcers, &c.

Symptoms. *Primary*—Of the above salts of copper when taken in excess. The tongue is dry and parched; a sense of strangulation is experienced, with great nausea, continued discharge of the saliva, vomiting, and coppery eructations. *Secondary*—Continued vomiting, or violent attempts to vomit; severe colic and tenesmus; great thirst; black and bloody discharges from the bowels; difficulty of breathing; pulse small, quick, and irregular; copious perspiration; cramps; gradual prostration of strength; convulsions; death.

Cause of Death. All these preparations of copper exert a direct effect upon the mucous membrane of the stomach and bowels, producing inflammation and gangrene.

Morbid Appearances. The mucous coat of the stomach is thickened, and sometimes tinged of a green colour; the pyloric orifice is nearly obliterated and sometimes surrounded with gangrenous patches, whilst perforations of the entire coats are not uncommon, permitting the escape of the contents of this organ into the cavity of the abdomen.

The whole intestinal chain, but particularly the colon, the cæcum, and the rectum, are in a state of intense vascularity, and present frequent ulcerations.

Remedies. Administer large quantities of sugar and water, or of syrup, until the stomach has been well excited to copious vomiting, continuing the draughts more moderately for some time afterwards. Permit the sufferer to drink freely of coffee well sweetened, when the stomach

is cleared, and afterwards give one or two doses of castor oil likewise in coffee, combined with thirty or forty drops of laudanum, should the pain in the abdomen continue. The filings of iron may also be proposed as an antidote. The use of the lancet will probably be required in combatting the secondary symptoms, together with fomentations, injections, and the tepid bath.

Rationale. Sugar and coffee are both said to decompose the salts of copper; the mucilaginous properties of the former may likewise tend in some degree to protect the stomach from the corrosive nature of the poison; and the subsequent treatment is directed in order to check the inflammation that will probably supervene. Iron filings added to a solution of these salts, precipitate the copper in a metallic form.

Tests. A small quantity of the solution of pure ammonia affords a beautiful blue colour to a liquid containing the salts of copper, adding more of the alkali when the poison has been received through the medium of any dishes containing vinegar. The addition of Potass throws down a blue precipitate, which is a sub-sulphate of copper. A few drops of recently prepared Guaiacum wood, added to a solution of the salts of copper, will occasion a blue colour, and if the quantity of the poison be very minute in the collected contents of the stomach, a few drops of prussic acid will instantly afford the same result; the blue colour gradually changing to a green, and at length disappearing: this is the most delicate test known of the presence of these poisonous salts.* If wine or any coloured fluid have been the vehicle for the administration of the poison, a small quantity of the solution of chlorine will discharge the colour, and the addition of prussiate of potass throw down a brown precipitate. A clean piece of steel, or a stick of phosphorus will become coated with the metal, if immersed in a solution of any of these three salts.

LEAD.

Two salts of this metal are employed in medicine, and are subject to improper administration—*The acetate of lead* (*acetas plumbi*,) commonly called *sugar of lead*; and *the sub-carbonate*, (*plumbi sub-carbonas*,) or *cerussc*, or *white lead*.

1st. *The Acetate of Lead.*

Preparation. The carbonate of lead is boiled in acetic acid, continuing the addition of the latter until it ceases to acquire a sweet taste, and afterwards evaporating the solution.

* If the vehicle be coffee, and a salt of copper be present, the addition of a few drops of the spirituous solution of guaiac will instantly produce a deep greenish blue precipitate. If port wine, the precipitate will be nearly of an indigo-blue colour, with a slight tinge of green. If beer, the precipitate will be of the colour of verditer. (Thomson.)

Chem. Comp. Character, &c.—According to Berzelius, this salt consists of

Acid,	26.97	100
Yellow Oxide,	58.71	217.662
Water,	14.32	
	<hr/>	
	100	

It presents the form of irregular masses, being an aggregation of acicular four-sided prisms terminated by dihedral summits, which are slightly efflorescent; by careful crystallization, it may be obtained in quadrangular prisms.

Soluble in about 25 parts of hot or cold water. Alcohol is likewise its ready solvent. *Taste*, sweet and astringent: *odour*, none. Specific gravity, 2.345.

Medical Use, &c. Internally, astringent, and a valuable remedy in the restraint of pulmonary and uterine hæmorrhages, either singly, or combined with opium. Dose, $\frac{1}{2}$ a grain to $1\frac{1}{2}$ gr. in pill. Externally, cooling and sedative in weak, and stimulant in strong solutions; employed in phlegmonous inflammation, &c., as an injection in gonorrhœa, and a collyrium.

2d. *The Sub-carbonate of Lead.*

Preparation. Spiral rolls or plates of metallic lead, are partially immersed in vinegar, by which they are oxidated and carbonated, and converted into *cerusse*, or white lead, which is dissolved by immersing them completely in the fluid; they are then withdrawn, and the same operation is repeated, until the acid is neutralized.

Chem. Comp. Character, &c. The sub-carbonate of lead consists of 83.5 parts of yellow oxide, and 16.5 of carbonic acid; in the form of a very white powder, friable, and of a minute sealy texture.

Insoluble in water, but *soluble* in a solution of pure potass. *Taste*, sweet and astringent: *odour*, none.

Medical Use, &c. Not internally employed. Its external application to excoriated parts is of questionable safety, and rarely resorted to.

Symptoms. When either salt is taken in excess. *Primary*—Violent colic, and general pains in the abdominal region; vomiting; small and hard pulse; anxiety and tremor. *Secondary*—Continued and excessive vomiting; laborious respiration, and great increase of pain in the abdomen; loss of muscular power, and paralysis of extremities. An obstinate costiveness prevails from an early period after the administration of the poison. When death ensues, it is usually preceded by great prostration of strength, delirium, and insensibility.

Cause of Death. The salts of lead act on the system by a suspension, or destruction of the nervous power, and occasion death by suffocation from paralysis of the respiratory muscles. (Paris.)

Morbid Appearances. In those cases, when death has rapidly followed the exhibition of the poison, the abdominal viscera will be

found in a state of inflammation, with occasional patches of extravasated blood ; but in no instance are the appearances so remarkable as those occasioned by the salts of copper. When death is not sudden, the mesenteric and lymphatic glands are increased in size, and in a state of great vascularity, and the lungs are gorged with blood.

Remedies. Administer large draughts of a solution of the sulphate of soda or magnesia ; when the bowels have been freely evacuated, opium may be given in two or three grain doses every two or three hours, and venesection practised. The patient may be immersed in a warm bath, or where that cannot be conveniently prepared, warm fomentations should be applied to the abdomen. Frequent injections of mutton broth, gruel, or any bland fluid, will complete the treatment.*

Rationale. The recent experiments of Orfila prove that the sulphates of soda and magnesia decompose the acetate of lead, converting that salt into an insoluble and inert sulphate. The opium is intended to allay the irritation existing, and it perhaps acts in some degree also as a counter-irritant, whilst the use of the lancet is required to check the progress of inflammation, and relieve the oppression under which the respiratory function is labouring.

Tests. To a solution of the acetate of lead, the addition of sulphuric acid occasions a white precipitate (the sulphate of lead.) A stream of sulphuretted hydrogen gas, passed through it, occasions first a dark tinge of the fluid, and then a black precipitate, which is a sulphuret of the metal. The addition of the sub-carbonate of soda will afford a very minute white precipitate (the carbonate of lead.) The sulphates of soda or magnesia, as described under the Remedies, will yield a precipitate of sulphate of lead, insoluble in acetic Acid. The chromic acid, and the chromates, give a yellow precipitate, which is the chromate of lead or king's yellow. Muria-tic acid and the muriate of soda will occasion an instant white precipitate. The sulphurets of ammonia and potass will precipitate a dark-coloured powder. The infusion of galls will occasion a yellowish white precipitate, which is a gallate of lead.†

* The preparations of antimony are said to be incompatible with the salts of lead ; and the successful treatment of saturnine colic, by tartarized antimony, would appear to favour the supposition.

† It has lately been discovered that gallic acid and tannin are capable of combining with lead in solution, and of forming a perfectly insoluble substance, which falls to the bottom of the vessel ; hence all vegetable astringents may be regarded as incompatible with the use of the salts of lead in medicine, and as antidotes to their administration as poisons. On this account, liquors which have been kept in oak casks for a length of time, must be freed from lead, and this explains a fact of some importance with respect to the effect of new rum in the West Indies. This spirit, when newly distilled, is found to contain traces of lead, derived from the rims of the copper and the worm of the still ; but, by being kept about twelve months in oaken casks, it loses its deleterious properties, and no longer exhibits any traces of the metal. (Paris.)

Any of the precipitates, melted with black flux,* will yield a small button of metallic lead.

Most of these agents may be employed in the detection of the sub-carbonate, or indeed of any of the salts of lead.

ZINC.

The only preparation of this metal that can be probably administered as a poison, is the *Sulphate (Sulphas Zinci) or White Vitriol*.

Preparation. It is procured from the sulphuret of zinc in the same manner as the sulphate of iron is obtained from its sulphuret.

Chem. Comp. Character, &c. This salt consists of 20 parts of oxide of zinc, sulphuric acid 40, and water of crystallization 40; in the form of white semi-transparent, and efflorescent four-sided prismatic crystals.

Soluble in three parts of water at 60° ; in less than its own weight, at 212° , and *insoluble* in alcohol. *Taste*, styptic and metallic: *odour*, none. Specific gravity, 1.9120, or, according to Watson, 1.534 at 42° .

Medical Use, &c. Internally, emetic, tonic, and astringent; for the first purpose ℥j to ℥iiss may be administered in cases of poisoning from other substances; for the second and third indications, it may be given in doses of from one to two grains, in spasmodic coughs, pulmonary affections when attended with excessive secretion, in leucorrhœa, and in the protracted stages of dysentery. Externally, it is employed in solution as a lotion, an injection in gonorrhœa, and as a collyrium.†

Symptoms when taken in Excess. *Primary*—A sour taste is experienced; excessive nausea precedes violent vomiting; and severe pains in the stomach and bowels ensue. *Secondary*—Diarrhœa soon succeeds; the respiration becomes affected, and the pain in the abdomen increased; the countenance is pallid and anxious, and the features shrunken; and the extremities become cold and trembling.

Cause of Death. In the few cases in which fatal results have followed the administration of this salt, there has been a want of power to discharge the whole mass from the stomach, and the remaining quantity has been sufficient to occasion inflammation and gangrene of its mucous coat. The emetic properties of the salt will generally

* Black flux is prepared by mixing one part of nitrate of potash with two of crystals of tartar, and melting them in a crucible.

† The oxide of zinc is very rarely employed in medicine; it has occasionally been administered as a tonic, and applied externally as a mild astringent. The acetate of zinc is rapidly coming into medical use, particularly as an injection in gonorrhœa.

effect its rapid expulsion, when the symptoms detailed are the consequences of its prompt and violent action.

Morbid Appearances. Patches of inflammation in the mucous membrane of the stomach and intestines; black extravasated blood on the muscular coats of these viscera, and general and increased vascularity throughout the whole intestinal canal.

Remedies. Supply the patient with frequent and copious draughts of milk; administer emollient injections, particularly if the pain in the abdomen continue after the vomiting has ceased, and bleed freely when the respiration is much oppressed.

Rationale. Orfila has directed the use of milk on account of its partially decomposing the poison, and from its emollient properties, in order to guard the mucous coat as much as possible from the corrosive action of the salt. The injections also answer the latter purpose, in some degree, should any portion of it have passed the pylorus.

Tests. If oxalic acid be dropped into a fluid containing the sulphate of zinc, a white precipitate ensues, which is the oxalate of that metal. The arseniates of potass or soda will likewise throw down a white precipitate, which is an arseniate of zinc. The chromate of potass will precipitate from a solution of this salt, an orange-yellow powder, which is a chromate of zinc.

ANTIMONY.

The Tartrate of Antimony (Tartras Antimonii,) or Tartar Emetic, is perhaps the only preparation of this metal that is likely to be administered as a poison.*

Preparation. The protoxide of antimony, reduced to very fine powder, is boiled with the bi-tartrate of potass, when the oxide, combining with the bi-tartrate, forms a soluble compound, which crystallizes on cooling.

Chem. Comp. Character, &c. This has been frequently described as a triple salt, consisting of tartaric acid, oxide of antimony, and potass. Gay Lussac, however, regards this salt as a compound of bi-tartrate (super-tartrate) of potass, which acts the part of an acid, and protoxide of antimony; and, from the experiments of Phillips, it appears that 100 parts of bi-tartrate will dissolve 70 of the protoxide.

The primitive form of its crystal is the regular tetrahedon, though it will assume a variety of secondary forms, and crystallize sometimes in trihedral pyramids. It is *soluble* in three times its weight of water at 212°, and in 15 parts at 60°. (Duncan.) *Taste*, styptic and metallic: *odour*, none. *Specific gravity*, 2.100.

* This metal yields several preparations. The sulphate of antimony, and also the precipitated sulphuret; the muriate, the oxide, and the glass of antimony.

Medical Use, &c. Internally, emetic in doses of from 1 to 3 grains; diaphoretic and expectorant: dose, $\frac{1}{8}$ to $\frac{1}{2}$ of a grain. An invaluable agent in the early stages of fever, and pneumonic inflammation. Externally, a very powerful rubefacient, occasioning a pustular eruption in the skin; prepared by trituration of the salt with lard, in the proportion of 3j to 3ij to 3i of the latter.

Symptoms when taken in excess. *Primary*—Nausea and severe sickness; hiccough; acute pain, and sense of heat in the stomach; small, frequent and hard pulse. *Secondary*—The pain in the abdomen becomes excruciating; the respiration oppressed; cramps and syncope succeed; the system becomes insensible to the strongest stimuli; vertigo; convulsions; death.

Cause of Death. The action of this poison is usually experienced through the circulation. In a great number of cases, it acts upon the heart, and occasions death by syncope; sometimes the brain is principally effected, and death ensues from inflammatory excitement and rapid effusion, whilst in some instances it may affect the intestinal canal, producing excessive inflammation, not so much from its corrosive properties, as from an excitement of the circulation, determined to the abdominal viscera.

Morbid Appearances. The stomach and small intestines are found inflated with gas; their mucous membranes inflamed; the peritoneum of a dark and dirty red colour; and the membranes of the brain in a state of extreme vascularity, and generally effusion into the ventricles of that organ.

Remedies. Administer, in the first instance, plentiful draughts of any bland fluid, in order to promote the evacuation of the whole of the poison; the vomiting, when excessive, may be allayed by two or three grains of opium, and repeated until their effect is evident. Large doses of a decoction of yellow cinchona bark, in which alum has been dissolved, should be given. It seldom occurs that a sufficient quantity of this decoction can be procured within a very short period after the poison has been swallowed; and therefore no time must be lost in exhibiting the previous remedies; if it were at hand, it would effectually answer the purpose of a diluent and an antidote. An infusion of rhubarb may likewise be recommended, if the cinchona bark cannot be quickly procured.

Rationale. When it is asserted that an ounce of a strong decoction of yellow bark is capable of decomposing and rendering inert a scruple of this salt, its merits, as an antidote, may be readily conceived; the addition of alum to the decoction assists the decomposition of the poison in the formation of an insoluble and harmless sulphate of antimony. The infusion of rhubarb likewise possesses the property, in a minor degree, of rendering the tartrate of antimony inert.

The opium tends to calm the irritation of the system, and may be recommended both in the primary and subsequent stages.

Tests. Reduce any of the poison that may be collected after carefully washing the stomach and intestines, in a small portion of distilled water, and heat it in a closed tube (as directed in the tests for the detection of corrosive sublimate,) when the odour of burnt vegetable matter will be perceived, and the powder, after blackening the tube, will soon deposit the metallic antimony on its sides. If no powder can be collected, the fluid collected in the stomach should be carefully strained, and exposed to the following tests:—Add to it a few drops of the tincture of galls, when, if tartrate of antimony be present, a precipitate of a dirty white, inclining to a yellow colour, and curdled, will be thrown down. Should the poison have been swallowed in the form of its vinous solution, the same test will give to the precipitate a bright violet colour. If the solvent have been tea, the addition of a small quantity of the hydro-sulphuret of ammonia will afford a red precipitate. A small quantity of the solution of alum will occasion a precipitate of a white colour.

ARSENIC.

This metal, so frequently rendered the instrument of crime, is rarely employed in medicine, except in the form of solution, when its doses may be better regulated, and its effects more easily controlled, than if administered in substance.

The most common preparation of arsenic, is *the white oxide*, or *arsenious acid*, usually termed in the shops *white arsenic*.

Preparation. It is obtained in large quantities during the roasting of metallic ores containing arsenic, particularly those of cobalt, condensing in flues connected with the furnace where the process is conducted, and being purified by a second sublimation. It likewise occurs native.

Chem. Comp. Character, &c. According to the calculations of Davy, it appears that the arsenious acid consists of about 25 parts of oxygen, and 75 of the metal. It is procured in the form of shining semi-vitreous lumps, breaking with a conchoidal fracture; if reduced to powder, it bears some resemblance to white sugar, for which substance it has sometimes been mistaken, especially by children. It volatilizes at the temperature of 415° , and by a very strong heat is vitrified into a transparent glass capable of crystallizing in tetrahedra with truncated angles. (Paris.)

Solubility. The estimate of Klaproth has generally been received as the correct one; he has shewn that it requires 400 parts of water at 60° , and only 13 at 212° , for its solution; and moreover, that if 100 parts of water be boiled on the arsenious acid, and suffered to cool, it will retain three grains in solution, and deposit the remainder in tetrahedral crystals. This fact shows the importance of employing boiling water in every chemical examination of substances sup-

posed to contain this poison. It is likewise soluble in alcohol and oils, the former taking up two per cent. Specific gravity, 3.7. *Taste*, acrid and corrosive, leaving a slight impression of sweetness: *odour*, none.*

Medical Use, &c. The extreme power of the preparations of arsenic renders their exhibition an object of great care to the physician. It will not suffice that small doses only are administered; the system must be closely watched, as its facility of accumulation may eventually place the patient in the same situation with one who has swallowed an over-dose of the poison. The custom of prescribing arsenic in substance made up into pills, is nearly discontinued, and the solution, known as Fowler's solution,† generally preferred, of which from four to twenty minims, very gradually increased, may be given twice a day. The operation of arsenic in medicine, is tonic, and, in some cases, of obstinate intermittent, chronic rheumatism, and diseases of the skin, its use has been followed by the best results. Externally, it is occasionally employed as an escharotic, particularly in the form of Justamond's caustic‡ to cancerous sores; but it must be distinctly remembered that "arsenic kills more readily when applied externally to an abraded part, than when internally administered;" the greatest caution is therefore necessary in its employment.

Symptoms when taken in excess. *Primary*—An acrid metallic taste and constant discharge of saliva; difficulty of swallowing from a sense of constriction; nausea, and vomiting of a brown matter, sometimes mixed with blood; excessive thirst; great pain and heat in the epigastric region. *Secondary*—All the above symptoms are greatly aggravated; fainting occurs; diarrhœa sets in, with extreme tenesmus; the discharges from the bowels become of green or black colour, and very offensive; the pulse is small, frequent, and intermittent; the surface of the body covered with cold perspiration, and annoyed by excessive itching; livid spots appear on the abdomen, which becomes distended; the strength is prostrated; the feet and hands paralyzed; and delirium and convulsions announce the approach of death.

* In the state of vapour it is quite inodorous, although it is asserted in many chemical works to yield a smell like that of garlic; the fact is, that this alliaceous smell is wholly confined to *metallic* arsenic in a state of vapour, and whenever the arsenious acid seems to yield this odour, we may infer that its decomposition has taken place; this happens when it is projected upon ignited charcoal, or when heated in contact with those metallic bodies which readily unite with oxygen. (Paris.)

† This preparation is thus formed: Arsenious acid, and sub-carbonate of potass, of each 64 grains; distilled water, 1 pint; alcohol, 4 drachms; boiled together until the arsenic be dissolved.

‡ This celebrated caustic, so frequently recommended in Continental Europe, consists of two parts of antimony, and one of arsenious acid, fluxed together in a crucible, afterwards levigated, and reduced to the necessary degree of mildness by the addition of powdered opium.

Cause of Death. Arsenic acts through the circulation upon the vital organs, as the heart, brain, or intestinal canal. In general, death occurs too quickly after the administration of this poison to be regarded as the result of inflammation.

It is capable of acting either as an external or internal agent, and is equally fatal whether received through the medium of the stomach, or introduced into the system by a wound.

Morbid Appearances. In the majority of instances of poisoning from arsenic, the absorption has been too rapid to permit its effects to be exercised on the mucous membrane of the intestinal canal, and hence the inexperienced observer is apt to form erroneous conclusions as to the injury sustained by the system. Where, however, the quantity of arsenic swallowed has not been very considerable, or where from constitutional debility the absorbents have not acted with their accustomed vigour, the morbid changes in the mucous membrane of the stomach, duodenum, jejunum, and ilium, are more perceptible; we may observe an increase of vascularity along the whole chain, sometimes a partial erosion of the villous coat of the stomach, or even patches of gangrene. The lungs are usually gorged with blood, and of a darkened hue; the membranes of the brain intensely vascular and thickened, their vessels turgid, and the ventricles occupied by effused fluid.

Thus it appears that, although arsenic may be considered as the most virulent of the metallic poisons, its effects are not the most visible; in fact, such is the violence of its action, that death follows the blow inflicted upon the circulatory system at large too speedily to allow its determination to any particular organ.

Remedies. Administer copious draughts of chalk and water, sugar and water, or lime-water. Meet any inflammatory symptoms by the use of fomentations, emollient enemas, and the tepid bath. When the poison has been evacuated from the stomach, and the pain and tenderness of the abdomen still continue, venesection must be practised. It would, however, be an unwise proceeding to bleed at an earlier stage, as absorption would thereby be accelerated.

When the first danger is overcome, the diet of the patient should be limited for a considerable period to farinaceous or other light and nourishing food.

Rationale. Any mucilaginous fluids will assist in the evacuation of the poison, and also protect, in some degree, the mucous coat from its corrosive action. The solution of chalk (the carbonate of lime,) and lime water, decompose the arsenious acid, forming an arsenite of lime, which is insoluble and inert.*

Tests. Tie a ligature around the cardiac and pyloric orifices of the stomach, and remove this organ from the body. Collect and

* All Alkaline solutions, and magnesia, lend additional virulence to arsenic, as tending to promote its absorption: the commonly proposed remedy of soap and water is therefore improper.

stram its contents, when the arsenic, in the form of a white powder, may probably be deposited; which should be boiled in an ounce or two of distilled water. The fluid must, however, be preserved if no sediment be obtained; and, as a further means of detection, the stomach may be cut into small pieces, and boiled in distilled water with two or three drachms of caustic potass, afterwards carefully filtering the fluid, and adding small portions of nitric acid, until the solution assumes a yellowish white colour, when it may be neutralized with potass.

A small portion of the powder thus obtained, should be mixed with three times its weight of black flux, and exposed to heat in a glass tube, as directed in the tests for corrosive sublimate; when, if arsenic be present, the inside of the tube will be coated with a shining metallic crust; a portion of this reduced metal may be scraped off, and laid on heated iron or charcoal, when it will exhale in dense fumes with a strong alliaceous odour.*

When the arsenious acid exists in solution, it may be detected by the following tests:

1st. Heat the solution to boiling; then add two or three grains of the sub-carbonate of potass, agitating the mixture; present to the surface of the fluid a stick of lunar caustic, when a yellow precipitate will instantly proceed from the point of contact, and settle towards the bottom of the vessel as a flocculent and copious powder. This is a most delicate test, capable of detecting the 60th part of a grain of arsenic in two ounces of water. (Hume.)

2d. Lime, Baryta, or Strontia water, added to a solution of arsenious acid, produces a white flocky precipitate, forming the arsenide of lime, Barytes, or Strontites, each of which is soluble in acids and alkalies. (Feuchtwanger.)†

* There is another mode of detecting arsenic by metallization. Mix the suspected powder with black flux, and place it between two polished plates of copper; bind them together by iron wire, and expose them to a low red heat, when, if the included powder contain arsenic, a silver-white stain will be left on the surface of the copper, which is an alloy of the two metals.

Neither of these metallic tests are, however, entitled to much confidence, except when confirmatory of others.

† As indicative of the presence of arsenic, the following test has been employed: The arsenide of lime, when dried, may be mixed with boracic acid and charcoal, placed in a glass tube, and heated over a strong flame; in this process, the boracic acid forms a borate of lime with the lime of the arsenide of that earth; the oxygen of the arsenious acid (and the same may be said of the arsenic acid) combines with the charcoal to form carbonic oxide, and carbonic acid, and the arsenic combines in a metallic state and lines the walls of the tube. The arsenide of lime, according to Dr. Hare, may be treated with the prussiate of mercury (the cyanuret of that metal,) in which case cyanogen, mercury, and arsenic, are sublimed in gas and vapour; the first goes off in the form of gas, the second is condensed in brilliant globular forms on the sides of the tube, and the third is perceived by its peculiar metallic lustre and characteristic odour.

See Remarks on Arsenic in the American Journal of Science and Arts, vol. XIX. No. 2. By Dr. Lewis Feuchtwanger, of New-York.

3d. Add a few grains of the sub-carbonate of potass, as before, to the boiling solution, and then a few drops of the solution of the ammoniacal sulphate of copper, when a grass green precipitate will ensue, which is an arsenide of copper, well known as the pigment, called Scheele's green.* If arsenious acid be not present, the precipitate will be of a delicate sky-blue colour.†

4th. If a stream of sulphuretted hydrogen gas be brought into contact with the solution, a deep yellow precipitate is afforded—the sulphuret of arsenic or orpiment, which is readily soluble in caustic potass or ammonia.‡

5th. The muriate of cobalt, when added to a neutralized solution of arsenious acid, throws down a pink-red precipitate.

6th. The muriate of nickel affords an apple-green precipitate, when added to a neutralized solution.

7th. Arsenious acid, when acidulated with some sulphuric acid, and brought into contact with a plate of zinc, presents the arsenic in its metallic state, at the negative pole.

8th. The perchloride of mercury (corrosive sublimate,) mixed with arsenious acid, and then with some lime-water, produces a white floccy precipitate, and not the orange-yellow powder, which we obtain by the combination of corrosive sublimate with lime water, known as the aqua phagedenica, or yellow wash. (Feuchtwanger.)

9th. Drop some of the suspected solution on a piece of white paper, making a broad line, along which draw a stick of lunar caustic, when a streak is produced of a light yellow colour, which remains permanent for some time, and then assumes a brown hue; this test, which should be practised in the shade, is confirmed by touching the streak lightly over with liquid ammonia, when the colour becomes remarkably brightened, and more permanent.§

Brugnatelli has proposed the following tests of arsenic and corrosive sublimate: “Boil the starch of wheat, recently prepared, in a small quantity of water; to this add a sufficient quantity of iodine to make it of a blue colour, and dilute it afterwards with pure water,

* An appearance similar to Scheele's Green is produced by the carbonate of potass, when added to a solution of copper containing coffee, but without arsenic, more striking than if a weak solution of arsenic be used. (Silliman's Journal, iii. 365.)

† If the fluid contain too much acid, no precipitate is obtained; and if the powder dissolve in ammonia, the solution contained no arsenious acid, but either a carbonate or a chromate of copper. (Feuchtwanger.)

‡ The sulphuret of arsenic thus formed, may be dried, mixed with equal parts of carbonate of potass, or caustic potass and charcoal, and heated over the flame of a spirit-lamp, when the sulphuret of arsenic is decomposed, and sulphuret of potassium formed: the oxygen of the potass combines with the carbon to form carbonic oxide, and carbonic acid, and the arsenic, in the metallic state, is sublimed in the tube. (Feuchtwanger.)

§ It is necessary to observe that the alkaline phosphates yield a yellow colour when dropped on paper and touched with the nitrate of silver; but the colour in fading becomes of a dull green.

until it becomes of a beautiful azure; if to this some drops of a watery solution of arsenic be added, the colour changes to a reddish hue, and finally vanishes. A solution of corrosive sublimate, poured into the above mixture, produces almost the same change as arsenic; but if to the fluid, acted upon by the latter, we add a few drops of sulphuric acid, the original blue colour is restored with more than its original brilliancy, while it produces no effect upon the mixture treated with the corrosive sublimate."

We have hitherto treated of the *arsenious* acid, or the common arsenic of commerce, which is the usual agent in medicine, as well as in crime, when this poison is selected as the means of destruction. There are, however, other preparations of the metal which have been, and may again be, improperly employed; such as the *arsenic acid*, the *sulphuret of arsenic*, or *orpiment*, and the *arsenide of arsenic*, or *Schcele's green*.

The *arsenic acid* is prepared by pouring six parts of nitric acid on arsenious acid, and exposing it to heat. It is not easily crystallized, but by very slow evaporation will form irregular crystals. According to Proust, it consists of 65.4 parts of arsenic, and 34.6 of oxygen. Berzelius renders it as composed of 58.366 of arsenic, and 41.634 of oxygen. It is soluble in two parts of boiling, and six of cold water, has a sour and metallic taste, and is inodorous. This preparation is not used in medicine; but its properties, as a poison, are even more deleterious than those of arsenious acid. The symptoms, both primary and secondary, the cause of death, morbid appearances, and remedies, are precisely the same as those described under the last head, to which the reader is referred. The tests, however, admit of some variation. A colourless solution of arsenic acid, brought into contact with lime, baryta or strontia water, produces a flocky white precipitate, which is soluble in an abundance of acid. (Feuchtwanger.)

The addition of the ammoniacal sulphate of copper yields a sky-blue precipitate. (Ibid.)

A stream of sulphuretted hydrogen, after some time, forms the yellow precipitate of sulphuret of arsenic. (Ibid.)

The nitrate of silver, added to a solution of arsenic acid, neutralized either with potass or ammonia, throws down a brick-colour precipitate.

Arsenic acid, added to a solution of corrosive sublimate, and then mixed with lime-water, has not the least effect. (Feuchtwanger.)

The muriates of cobalt and nickel are alike indifferent to arsenic acid. (Ibid.)

The *sulphuret of arsenic*, or *orpiment*, contains 3 parts of sulphur, and 4 of arsenic; is found native in yellow brilliant masses, or procured by distillation of the oxide with sulphur. It holds no place in the pharmacopeia, and is not likely to be administered as a poison. If it have been swallowed in error or by design, it may be tested by a col-

lection of the contents of the stomach as before directed, which must then be boiled with nitrous acid, so as to form the arsenious acid; when the mode already detailed may be pursued for its detection.

The arsenide of copper, or Scheele's green, is prepared by the mixture of the arsenide of potass, and the sulphate of potass, simply boiling their solutions, by which a double decomposition is effected, and the pigment formed.

It has no use in medicine; the symptoms, &c., would be precisely the same as those occasioned by arsenious acid. In detecting this preparation, it will be necessary to boil any collected portions, or a suspected solution, with aqua regia, filtering it while hot, and neutralizing it with ammonia, when it may be exposed to the same tests as directed under the head of arsenious acid.

E A R T H S.

BARYTES.

The muriate of this earth (*Murias Barytæ*) is the only preparation employed in medicine. It is scarcely probable that this salt can be administered as a poison, and hence its deleterious effects are only experienced when given unadvisedly or in improper doses.

Preparation. The sulphate of barytes,* mixed with charcoal, is exposed to a strong heat, in a crucible; the oxygen, both of the acid and the barytes, is disengaged in combination with the carbon in the form of carbonic acid, and a sulphuret of barium remains; this is then thrown into water, a portion of which is decomposed; its oxygen combines with the barium, whilst its hydrogen unites with the sulphur, a hydro-sulphuret of barytes being formed, which is dissolved by the rest of the water; and on adding muriatic acid to it, the sulphuretted hydrogen is disengaged, while the acid combines with the barytes, forming a muriate, which remains in solution, and is obtained in crystals by evaporation.

* The sulphate of barytes, or heavy spar, as it is sometimes termed from its weight, exists in considerable quantity in nature, and is always formed in chemical operations, where barytes and sulphuric acid come into contact, from the great attraction they have for each other. (Reid.)

Chem. Comp. Character, &c. This salt, according to Berzelius, consists of

Muriatic acid,	23.35 parts.
Barytes,	61.85
Water of crystallization,	14.80
	<hr/> 100

Sir H. Davy considered the dry salt as a compound of one atom of barium, weighing 65, and one atom of chlorine, 33.5; hence 100 parts should consist of 34 parts of chlorine, and 66 of barium. The crystals are regular, having commonly the shape of tables, bevelled at the edges, or of eight-sided pyramids, applied base to base. Soluble in three parts of water at 60°; in a less quantity at 212°, but scarcely at all in alcohol. *Taste*, bitter and styptic; *odour*, none.

Medical Use, &c. The solution of this salt is medicinally employed in the proportion of one part to three parts of distilled water, as a stimulant, deobstruent, and diuretic, in scrophulous maladies, glandular affections, worms, and cutaneous diseases. Dose, from five to ten minims twice a day, gradually increased, until nausea is produced. Externally, it is applied to indolent and fungous ulcers.

It is incompatible with the sulphate of soda and alumine, and the nitrates of potash and silver.

Symptoms when taken in excess. *Primary*—Excessive vomiting and diarrhœa, with excruciating pains in the stomach and bowels. *Secondary*—Vertigo; stupor; paralysis of extremities; convulsions; death.

Cause of Death. This poison acts rapidly through the circulation upon vital organs; thus, upon the heart it produces a fatal syncope, or upon the brain, when it occasions convulsions. The corrosive properties of the salt would be sufficient to destroy life by gangrene of the intestinal canal, were the circulatory system not primarily affected.

Morbid Appearances. In general, the mucous membrane of the stomach will be found in a state of great vascularity, notwithstanding the determination of the poison to the circulation; the membranes of the brain inflamed, the ventricles filled with effused fluid, and the vessels turgid.

Remedies. Every effort should be made to excite vomiting, both by an irritation of the fauces with a feather, and by the administration of the sulphate of zinc or copper as an emetic, promoting their effects by plentiful and repeated draughts of any bland fluid. The solutions of soda or magnesia may also be freely administered.

Rationale. The use of an emetic is obvious; the bland fluids will protect in some degree the tender mucous coat of the stomach from the corrosive properties of the salt, and the sulphates of soda and magnesia will decompose the muriate, and convert it into an insoluble and inert sulphate of barytes.

Tests. Drop into the suspected solution a little sulphuric acid, when if the muriate of barytes be present, a white precipitate will be occasioned, which is a sulphate of the earth, and insoluble in nitric acid. Add a few grains of the nitrate of silver to another portion of the solution, and a curdled, white precipitate, insoluble in water and nitric acid, will betray the existence of the poison. If wine, coffee, &c., have been the medium by which this salt has been administered, a solution of chlorine will destroy the colour; but care must be afterwards taken to dissipate the chlorine by heat, before the nitrate of silver is employed as a test.

LIME.

This earth is employed in medicine to a very trifling extent, except in the formation of the lime-water (*liquor calcis*) of the pharmacopeia. One or two instances are recorded where it has been administered as a poison.

Preparation. Limestone, chalk or marble, being all varieties of the carbonate of lime, are exposed to a strong heat, when the carbonic acid is disengaged in the gaseous state, while the lime remains.

Chem. Comp. Character, &c. Lime is a compound of calcium and oxygen, in which, according to Sir H. Davy, the oxygen is to the metal as 7.5 to 20. It is of a white colour, moderately hard, and requires an intense heat for its fusion. Specific gravity, 2.3.

Solubility. Water dissolves only about its 1.450th part.* **Taste,** acrid and alkaline: **odour,** none.

Medical Use, &c. The employment of lime, as an escharotic, has long ceased, and internally it has never been employed in substance. Its solution, commonly called lime-water, is astringent, tonic, antacid, and anthelmintic, and is a valuable remedy in dyspepsia, when much acid prevails in the stomach, in diabetes, diarrhœa, and worms. Dose, $\mathfrak{z}\text{ij}$ to $\mathfrak{z}\text{vj}$ with milk.

Lime-water is used in preparing the black wash (*Lotio Hydrargyri nigra*), and the yellow wash (*Lotio Hydrargyri flava*), sometimes called the *aqua phagedenica*, both so extensively used in the treatment of venereal ulcers.

The solution of the muriate of lime is sometimes recommended as a tonic and stimulant in scrophulous and debilitated habits, in doses of from 30 minims to $\mathfrak{z}\text{j}$ twice a day.

Symptoms when Lime has been swallowed. *Primary*—Great nausea and vomiting; heat of the fauces and tonsils; and constriction of

* It is a curious fact, that lime dissolves more plentifully in cold than in hot water; at the freezing point, or nearly so, it is probable that water would take up nearly twice as much lime as is dissolved by boiling water. (Dalton.)

the œsophagus. *Secondary*—Excruciating pains in the stomach and bowels, followed by the usual circumstances attendant upon abdominal inflammation.

Cause of Death. The corrosive properties of the lime acts upon the mucous membrane of the stomach and intestines, producing inflammation and gangrene.

Morbid Appearances. Intense inflammation of the stomach and bowels is observed, with patches of gangrene and perforations of the mucous membrane.

Remedies. Administer, in large quantities, lemon-juice, vinegar, or any vegetable acid that can be procured, and afterwards repeated draughts of mild or mucilaginous fluids, continuing their exhibition for some time after the vomiting has ceased. Bleeding, fomentations, and emollient injections, must be had recourse to, as inflammatory symptoms supervene.

Rationale. The vegetable acids tend to decompose the lime in the stomach, depriving it of its corrosive properties. The necessity of the ulterior measures is sufficiently obvious.

Tests. Collect what portion of a suspected substance may be found in the stomach or bowels, and pour over it distilled water; stop the vessel closely, and, after a short time, filter; add a little oxalic acid, and if lime be present, a precipitate, which is the oxalate of lime, will immediately ensue; by submitting this powder to heat, the oxalic acid is easily destroyed, and the lime left in a pure state. The taste of the above solution will also assist the detection of this earth, as its strong and styptic flavour is readily recognised. The vegetable blues will be changed to a green colour by the same solution. A small pellicle will arise on the surface of the liquid on its exposure to the air, which is soluble with effervescence in a vegetable acid. There are other tests of the presence of this earth; but the improbability of its being swallowed as a poison, and the efficacy of the oxalic acid in its detection, render further detail unnecessary.

ALKALIES.

POTASS.

The Nitrate of Potash (*Nitras Potassæ*), or *Saltpetre*, has occasionally been mistaken for Epsom or Glauber salts; and a few examples are on record, of its having been administered with a criminal intention.

Preparation. Mixtures of animal and vegetable substances, to which carbonate of lime is added, are exposed to the action of the air, and at the same time protected from rain. The nitric acid is formed by the re-action of the lime on the animal substances and the air, and the potash which is afforded by the vegetable substances, decomposes it, and forms nitrate of potash. If there be not sufficient potash to decompose all the nitrate of lime, some wood-ashes are added to complete the decomposition. The salt is then purified by repeated solution and crystallization. It is obtained in large quantities in India, where it exists in an efflorescent state at the surface of the earth.

Chem. Comp. Character, &c. It consists of 51.8 of potass, 44 of nitric acid, and 4.2 of water. The crystals are six-sided prisms, terminated by dihedral summits. *Soluble* in seven parts of water at 60°, and in its own weight at 212°. *Taste*, sharpe and bitter: *odour*, none. *Specific Gravity*, 2.00.

Medical Use, &c. Diuretic, refrigerant, and in large doses purgative; administered in fevers, dropsies, active hæmorrhages, and gonorrhœa. Dose, gr. x to ʒss in any bland fluid.

Incompatible with alum, sulphate of magnesia, sulphuric acid, and the sulphates of iron, zinc, and copper.

Symptoms when taken in excess. *Primary*—Immediate nausea and vomiting; and excruciating pain in the stomach and bowels. *Secondary*—Continued sickness and diarrhœa, with discharges of blood; the pain becomes still more agonizing; the respiration is impeded; syncope takes place; and paralysis of the extremities and convulsions are the precursors of death.

Cause of Death. A direct influence is produced upon the mucous coats of the stomach and intestines by the corrosive nature of the poison, occasioning inflammation and gangrene.

Morbid Appearances. General signs of inflammation and gangrenous patches throughout the whole intestinal canal; the stomach in particular is affected, and in some cases perforations of its coats may be observed.

Remedies. Give the patient copious draughts of any bland fluid, such as milk, barley-water, &c.; and afterwards administer emollient enemas. One or two grains of opium, in conjunction with aromatics, may then be supplied, and repeated every two or three hours. Venesection and leeches to the abdomen will generally be necessary, together with fomentations.

The *Rationale* of these measures is sufficiently obvious.

Tests. Evaporate the contents of the stomach to dryness; collect the residue, and pour upon it hot sulphuric acid, when, if the nitrate of potass be present in excess, nitrous acid fumes will be given out. Throw a portion of the dried mass upon hot coals, when the nitrate of potass will immediately deflagrate. Platina and its muriate are delicate tests of all the salts of potass. The latter may be applied to the detection of the nitrate, by adding a small quantity to the contents of the stomach, when an orange-coloured precipitate will ensue.*

There is a second preparation of potass, of extreme power as an external medical agent, which by possibility might be made use of as a poison—*The Caustic Potass* (*Kali Causticum vel Potassa Fusa*), or *Lapis Infernalis*. This substance is, in fact, an hydrated protoxide of potassium, although when it is cast into moulds, it generally contains a little peroxide, and therefore evolves oxygen when dissolved in water.

Preparation. The water of potass, formed from the pearl-ash, is evaporated in an iron basin, until it acquires the consistence of oil, which is run into cylindrical moulds, becoming solid as it cools.

Chem. Comp. Character, &c. It consists of 82.3 parts of potassium and 17.7 of oxygen; but it is not unfrequently accompanied with small portions of silice, lime, and oxide of iron; is of a grey brittle substance, and extremely deliquescent. *Taste*, acrid and caustic; inodorous.

Solubility. One ounce of water will dissolve seven drachms; it is also soluble in alcohol.

Medical Use, &c. Only externally applied as a caustic in establishing an ulcer or issue, or instead of the knife in opening a tumour.

The symptoms, cause of death, morbid appearances, and remedies, are the same as those described under the former head.

* This test is, however, applicable to ammonia, and therefore becomes less valuable. The evaporation and examination of the residue is the most certain mode of proceeding.

Tests. A solution of this substance will feel soapy to the touch, turn the vegetable red and blue colours to green, and occasion an immediate precipitate from a solution of nitrate of silver, in the form of a dark-coloured oxide, soluble in nitric acid. A portion of the liquor vomited, or collected after death from the stomach, may be evaporated to dryness; upon exposure of the mass to the air, the presence of potass will be ascertained by its deliquescence.*

AMMONIA.

This alkali exists as an invisible gas, which, when largely absorbed by water (one measure of this fluid condensing 460 times its weight of ammoniacal gas,) forms the liquid ammonia used in medicine, and also capable of being employed as a poison.

Preparation. Four parts of the muriate of ammonia, or sal ammoniac, are mixed with three parts of well burnt lime, and the whole exposed to heat in a retort. The muriatic acid of the sal ammoniac combines with the lime, and the ammonia is expelled in the gaseous state; this is received over mercury, as it would be immediately condensed by water.

The watery solution of ammonia is obtained by introducing a tube, connected with the end of the retort, into a bottle containing water, which must be surrounded with ice, snow, or a frigorific mixture.

Chem. Comp. Character, &c. Ammonia is a compound of nitrogen and hydrogen, consisting of three volumes of the latter and one volume of the former, condensed into two volumes; these three volumes of hydrogen represent three atoms equal to 3.75, and one volume of nitrogen is equal to one atom of this substance or 17.5; the prime equivalent therefore being 21.25. (Reid.) According to Gay Lussac its specific gravity is to that of common air, as 0.5967 to 1. The solution has generally the specific gravity of 0.954, and it cannot conveniently be kept stronger.

Medical Use, &c. The liquid ammonia (liquor ammoniæ) internally is a powerful stimulant and antacid in doses of from 10 to 30 minims. Externally, a rubefacient.

The principal preparations of this alkali, employed in medicine, are the acetate, the sub-carbonate, and the muriate of ammonia (or sal ammoniac.)

Symptoms when taken in excess. Should a large quantity be swallowed, an immediate sense of suffocation is experienced, which is quickly followed by convulsions and death. In milder cases the mouth and fauces are excoriated by the caustic action of the fluid, great heat prevailing in those situations and in the throat. *Secondarily*—The bowels are violently affected with griping pains; severe vomit-

* This is not the case with caustic soda, or any of the salts of that alkali.

ing ensues, with discharges of blood both from the stomach and bowels; delirium supervenes; and finally, convulsions precede dissolution.

The Cause of Death and the Morbid Appearances are nearly the same as those described under the head of nitrate of potass, although this poison will act with greater quickness, and produce stronger evidence of inflammation. *The Remedies* are likewise the same.

Tests. Liquid ammonia is easily recognised in the evacuations before, and in the contents of the stomach after death, by its pungent odour, and its alteration of the vegetable blues and reds to a green colour.

If a piece of bright copper be immersed in a fluid containing ammonia in excess, a blue colour is immediately produced; and a similar result is effected by adding a diluted solution of the acetate or sulphate of copper, or, in fact, by any of the salts of that metal.*

MINERAL ACIDS.

SULPHURIC.

(*Acidum Sulphuricum*,) or Oil of Vitriol.

Preparation. One part of sulphur is mixed with one-ninth of its weight of nitre, and placed in a vessel which is enclosed in a leaden chamber filled with water to the depth of several inches, and having an aperture at the top for the admission of the air. The mixture is then kindled, when the sulphur unites with the oxygen of the air, and forms sulphurous acid,† which, acting upon the nitre, causes it to give out nitric oxide gas, and which also, coming in contact with the air, imbibes a portion of its oxygen, and forms nitrous acid. These sulphurous and nitrous acid gases combine, and would assume a solid form if water were not present; but the moment they come in contact with that fluid, the nitrous acid gas is decomposed, gives oxygen to the sulphurous acid gas, and forms, by uniting with it, *sul-*

* A solution of the nitrate of silver produces no result either in colour or by precipitate, when added to liquid ammonia.

† Sulphurous acid is formed during the combustion of sulphur in atmospheric air or oxygen gas, or by the decomposition of sulphuric acid.

phuric acid. (Brande.) When the water in the chamber has imbibed a sufficient quantity of acid, it is conveyed into a leaden vessel, where it is evaporated until it has acquired the specific gravity of 1600 or 1700 (water being 1000,) and for general use, it is afterwards placed in glass or platina retorts, for the purpose of driving off a larger portion of the water, when sulphuric acid of the specific gravity of 1.850 is finally obtained.

Chem. Comp. Character, &c. This acid, when pure, is a colourless fluid, and, in its strongest state, may be said (according to Davy) to consist of 30 parts of sulphur, 45 of oxygen, and 17 of water. It has a powerful affinity for water, producing, when mixed with it, a considerable degree of heat. *Taste*, excessively acid and corrosive, and on exposure to the air, it emits white fumes of an oppressive and suffocating odour.

Medical Use, &c. In a diluted form, prepared by the addition of ℥iiss of acid to ℥xivss of distilled water, this acid is employed internally, as a tonic, astringent and refrigerant, in the treatment of dyspepsia, diabetes, hæmorrhages, hectic fever, and cutaneous eruptions. Dose, from ten to thirty minims largely diluted. In detergent gargles, it is used in the proportion of ℥i to ℥iij , to ℥viiij of fluid. Externally, the strong acid is occasionally applied to the edges of callous ulcers, or made up into an ointment, ℥i of the acid to ℥i of lard, for the cure of scabies.

Symptoms when taken in excess. *Primary*—Sharp and corrosive taste about the lips and mouth; a sense of burning in the fauces and throat continued along the œsophagus to the stomach, with excruciating pains; vomiting and intolerable fœtor of breath. *Secondary*—Continued sickness, and discharges of frothy matter and blood from the stomach; difficulty of respiration, and a croupy cough; intense symptoms of abdominal inflammation; small and irregular pulse; great anxiety and restlessness; convulsions; death.

Cause of Death. The rapid effects of this caustic acid upon the coats of the stomach and intestines, produce inflammation and gangrene.

Morbid Appearances. The coats of the stomach are ulcerated, black, and corroded; the organ itself distended with gas and a quantity of dark bloody matter.

The lips, mouth, œsophagus, and every part of the alimentary canal to which the acid has extended, present unequivocal marks of its destructive properties.

Remedies. Instant and copious draughts of milk, containing powdered chalk or magnesia, should be administered; or where these cannot be readily obtained at an early period, soap may be dissolved in warm water, and given until excessive vomiting be occasioned. The solutions of the carbonate of potass or soda are likewise of infinite value, if promptly taken. The inflammatory symptoms must, of course, be met by the lancet, fomentations, and injections.

Rationale. The solutions of the carbonate of lime (chalk,) magnesia, or those of the fixed alkalies, are directed with the view of decomposing the acid, and rendering it inert. The other remedies merely apply to the evacuation of the poison from the stomach, and the protection of the system from its effects.

Tests. If any quantity of the acid can be collected, it may be recognised by its caustic taste, specific weight, and by its evolving heat, when mixed with water.

Add a small quantity of chalk to the suspected fluid, and a copious precipitate will ensue, which, after washing, should be boiled in distilled water; to the clear solution some barytic water may be added, when, if sulphuric acid be present, a sulphate of barytes, in the form of a white powder, will fall down, which is insoluble in nitric acid.

Boil the contents of the stomach with crude mercury, and sulphuric acid will be detected by the rapid production of sulphurous acid gas, which is readily recognised by its peculiar odour.

NITRIC ACID.

(*Acidum Nitricum,*) or Aqua Fortis.

Preparation. Three parts of the nitrate of potash are coarsely pounded, and put into a glass retort; two parts of sulphuric acid are then added, and the whole exposed to moderate heat in a sand-bath. The sulphuric acid combines with the potash, and the nitric acid is disengaged; being volatilized by the heat, it passes through the neck of the retort into a receiver which is connected with it, and kept very cold where it is condensed.

Chem. Comp. Character, &c. Nitric acid, when pure, is colourless, and consists of 25.97 parts of nitrogen, and 74.33 of oxygen. Sir H. Davy considered it as a compound of one atom of nitrogen with one atom of hydrogen, and six atoms of oxygen. Its specific gravity, at its utmost density, is about 1.42, and it requires a temperature of 250° to make it boil, when it distils over without change. It has been frozen at 40° below zero. *Taste*, exceedingly acrid and caustic, and emits white fumes of a pungent and suffocating odour.

Medical Use, &c. It is employed, when diluted in the proportion of ʒi to ʒix of water, as a tonic, antiseptic, and anti-syphilitic, and has been much extolled in the treatment of diseases of the liver, and the sequelæ of venereal attacks. Dose, from ten to thirty minims in ʒiij of water. Externally, it is sometimes used as an escharotic where an immediate destruction of diseased parts is required.

Symptoms when taken in excess. *Primary*—Should the quantity swallowed have been considerable, almost immediate death is the result; in other instances, a sensation of heat and pain in the mouth,

œsophagus, and stomach, is complained of; the breath becomes fœtid; vomiting takes place; and all the symptoms of violent abdominal inflammation are apparent. *Secondary*—The vomiting increases to an extreme degree; and shreds of membrane, mixed with mucus and blood, are evacuated from the stomach: should life be prolonged for a few days, obstinate constipation prevails; and if a dejection be obtained, it is at the expense of great agony. The symptoms of inflammation gradually increase until within a few hours of death.

The Cause of Death is the same as that produced by the action of sulphuric acid.

Morbid Appearances. The lips, tongue, and fauces are covered with orange-coloured spots, and the mucous membrane of œsophagus and stomach coated with a layer of yellow matter, and perforated in many places, whilst the whole of the alimentary canal exposed to the action of this corrosive acid, exhibits its destructive qualities.

Remedies. Copious and frequent draughts of alkaline solutions, as directed under the head of sulphuric acid. The stomach may afterwards be evacuated by administering large quantities of any bland fluid, the inflammatory symptoms requiring bleeding, the tepid bath, injections, &c.

The *Rationale* of this treatment is similar to that described in a case of poisoning from sulphuric acid.

Tests. The appearances after death, in the orange-coloured spots on the tongue and fauces, and the yellow coating of the stomach, afford the strongest proof that this acid has been swallowed. In addition to these signs, any fluid collected may be boiled over copper filings, when orange-coloured fumes will be evolved, if nitric acid be present.

MURIATIC ACID.

(*Acidum Muriaticum*,) commonly called Spirits of Salt.

Preparation. A given weight of the muriate of soda, or common salt, is placed in a glass retort, and with an equal quantity of sulphuric acid, exposed to heat in a sand-bath. Muriatic acid gas is then freely disengaged, which must be received in jars over mercury, as water instantly absorbs it. The water of the sulphuric acid is decomposed in this process, the sodium attracts the oxygen, and soda is produced, with which the sulphuric acid combines to form a sulphate of soda, while the hydrogen of the water, uniting with the disengaged chlorine, forms muriatic acid, which is expelled by the heat.

Chem. Comp. Character, &c. Muriatic gas having been discovered to consist of a compound of chlorine and hydrogen in equal volumes,

this acid has received a name more expressive of its composition—the Hydro-chloric Acid. It is colourless when quite pure; but from the presence of a small quantity of the muriate of iron, generally of an amber colour, and has a great affinity for water. Sir H. Davy states, that water at 40° can absorb 480 times its volume of muriatic acid gas, and that the specific gravity of this solution is 1.2109; this is the state in which the acid is generally employed, and is formed by simply passing the gas through water, until it will absorb no more. If the vessel containing the water be kept very cold, a large portion of acid may thus be obtained, ranging in specific gravity from 1.150 to 1.400. *Taste*, intensely sour and caustic: *odour*, pungent and oppressive.

Medical Use, &c. This acid is also tonic, antiseptic, and diuretic in operation. Internally, it is administered in some bland fluid, as barley-water, gruel, &c. in cases of malignant typhus or scarlet fever; as a gargle in inflammatory sore throat, and when largely diluted, as an injection in gonorrhœa. *Dose*, from ten to twenty minims in an abundance of fluid, 3ss to ʒi in gargle, and, as injection, eight minims to ʒiv of water. Externally, it has been employed in union with the nitric acid in the formation of a bath, which, thus acidulated, has been frequently recommended as a powerful remedy for diseases of the liver in particular, and as a general substitute for the use of mercury.

Symptoms when taken in excess. *Primary*—A sensation of heat and pain in the mouth and throat, with great thirst and vomiting. *Secondary*—The eyes become red and inflamed; the lips of a brown or blackened hue; the skin hot and dry; the pulse hard and frequent; bloody mucus is voided from the stomach; the pain extends to the bowels, and increases to an agonizing extent; a cold and clammy perspiration ensues, until the approach of delirium, coma, and death.*

Cause of Death. The same as described under the heads of the two former mineral acids.

Morbid Appearances. The mouth, œsophagus, and stomach, are found of a deep red colour, and bearing marks of excessive inflammation; patches of extravasated blood and perforations through the mucous coats occur, sometimes penetrating the entire tissues of these viscera.

Remedies. Administer promptly the alkaline or magnesian draughts recommended in cases of poisoning from the other mineral acids, employing subsequently the same means in guarding against or restraining inflammation.

The *Rationale* is sufficiently obvious.

Tests. Collect any fluid that may be found in the stomach, and

* Orfila describes a fume of a sharp penetrating odour, as issuing from the mouth, when a considerable quantity of this acid has been swallowed.

after straining it, dip into it a glass rod moistened with ammonia, when, if muriatic acid be present, dense white fumes of muriate of ammonia will immediately be observed. If mixed in any coloured menstruum, the acid will be detected by distilling the fluid from a small retort into a vessel containing nitrate of silver, when a muriate of that metal is precipitated, recognisable by its solubility in ammonia, and its insolubility in nitric acid. The contents of the stomach, either as vomited or collected after death, may be boiled for an hour with a diluted solution of potass; the fluid should be filtered, and a nitrate of silver added, when a precipitate, likewise a muriate of silver, is the result, provided muriatic acid be present.

VEGETABLE ACIDS.

OXALIC ACID.

This destructive poison holds no place in the pharmacopeia; but, from its slight resemblance to the sulphate of magnesia, or Epsom salts, it has frequently been mistaken for that aperient.*

Preparation. Oxalic acid exists in considerable quantity in wood-sorrel (the *oxalis acetosella*), in combination with a small portion of potass, forming the bin-oxalate of potass. The acid is readily obtained from this compound by saturating it with ammonia, adding nitrate of barytes to the solution, and decomposing the insoluble oxalate of barytes, which is formed by sulphuric acid. An easier mode of obtaining the acid for the purposes of the arts is now adopted. One ounce of sugar is coarsely pounded, and introduced into a retort with six ounces of nitric acid; a gentle heat is then applied, when a large quantity of nitric oxide is disengaged; the sugar is entirely dissolved, and on continuing the distillation of the nitric acid for a short time, a fluid is obtained of the consistence of syrup, which, on cooling, affords crystals of oxalic acid, equal in weight to rather more than half the quantity of sugar employed.

* The purgative salt may be thus distinguished from the deleterious acid. The latter has a very sour taste, even when diluted with a large portion of water, while the sulphate of magnesia has a pure bitter taste. The acid reddens the vegetable blues, while the salt has no effect upon them; the former also causes an effervescence when added to alkaline carbonates; the latter gives an insoluble carbonate with such compounds. (Reid.)

Chem. Comp. Character, &c. According to Berzelius, it consists of 66.211 parts of oxygen, 33.021 parts of carbon, and 0.728 of hydrogen.* The crystals are generally four-sided prisms, unless the solution has been strong and quickly cooled, when they will appear in a small acicular form. *Soluble* in one part of boiling water and in two parts of cold water; also soluble in between two and three times its weight of cold and in less than twice its weight of boiling alcohol. *Taste*, very sour; inodorous.

Symptoms. Primary—An intensely acid taste prevails in the mouth, with great nausea, and constant, although ineffectual, attempts to vomit. *Secondary*—A dry and burning taste is complained of in the mouth and fauces, and great pain, heat, and oppression, in the epigastric region; the pulse is hard and contracted; the forehead bedewed with perspiration; small quantities of mucus, slightly tinged with blood, are occasionally evacuated from the stomach; the pupils become dilated; the intellect wanders until violent delirium occurs, which is soon followed by convulsions and death.

Cause of Death. Oxalic acid acts as a corrosive poison, causing inflammation and gangrene of the stomach and intestines.

Morbid Appearances. These are similar, although less in degree to the appearances produced by the action of the mineral acids. A viscid light-coloured mucus is usually visible on the tongue and fauces, and in some instances a portion of the stomach is altered in its consistence, and converted into a pulpy mass. The brain, when sliced, frequently presents more bloody points than natural, and turbid serum is not uncommon in the lateral ventricles; these appearances may readily be accounted for in the excitement that has prevailed in the system from the intense action of the poison.

Remedies. Administer, as quickly as possible, large quantities of alkaline or magnesian solutions; when these cannot be readily procured, whitening may be mixed with warm water, and given in as copious draughts as the sufferer can bear. The common remedy of soap and water, in the absence of other materials, has frequently been afforded with the best effect. In addition to the alkaline draughts, an emetic of two scruples of the sulphate of zinc may be administered. Venesection, fomentations, and injections, and afterwards cathartics (of which the croton oil* from its power may be preferred,) will be demanded upon the approach of the inflammatory symptoms.

Rationale. The alkaline solutions have a similar effect in neutralizing this poison, as described under former heads, forming oxalates of magnesia, potass or soda, by the combination of the acids with

* From Dobereiner's experiments, it appears that oxalic acid does not essentially contain any hydrogen, and that it differs from carbonic acid merely in the proportion of its elements: its ultimate analysis shews that it consists of two atoms of carbon equal to 15, and three atoms of oxygen equal to 30.

their bases, the solution of whitening converting the acid into an inert oxalate of lime; and the alkali, in the solution of soap, rendering the acid innoxious, while the mixture acts at the same time as an emetic. The reasons for the subsequent measures are sufficiently obvious.

Tests. The most delicate test of oxalic acid, is lime-water, which throws down a copious white precipitate, which is an oxalate of lime. Alumina may be dissolved in a suspected solution; when, if oxalic acid be present, it will give, upon evaporation, a yellowish transparent mass, sweet, slightly astringent, and deliquescent; reddening tincture of litmus paper, but not the syrup of violets. This test must, however, yield to the former both in certainty and delicacy. The alkaline and magnesian solutions will occasion precipitates, which are the oxalates of those bodies.

PRUSSIC OR HYDRO-CYANIC ACID.*

This poison, which possesses greater activity than any other derived from the vegetable kingdom, exists in the kernels of various fruits, such as the peach, apricot, plum, cherry, almond, &c., imparting the peculiar flavour by which they are distinguished.† The leaves of the lauro-cerasus also contain this acid. The quantity that can be thus procured, is, however, very small; and therefore we resort to the Prussiate or Ferro-cyanate of iron, or Prussian blue, for its production.

Preparation. There are various modes by which this acid is procured; that of Scheele's, which is, perhaps, the most extensively used in medicine, is prepared by digesting one ounce of the red oxide of mercury with two ounces of Prussian blue in six ounces of water, and boiling it for a few minutes, carefully agitating it the whole time. It is then filtered, and to the clear solution three drachms of sulphuric acid and an ounce and a half of iron filings are added. When all action has ceased, the clear liquor is exposed to heat in a retort, and afterwards the hydro-cyanic acid separated by distillation.‡

Chem. Comp. Character, &c. Until the year 1815, the precise

* This acid was formerly ranked among those which are peculiar to the animal kingdom, as it was procured by the decomposition of animal substances; Roloff and Bucholz were the first who distinctly proved its existence as a proximate principle in the vegetable kingdom, which had long been suspected from the peculiar smell of several vegetable products. (Reid.)

† The Prussic acid would appear to be most abundant in the thin pellicle that envelops the kernel; the fleshy parts of these fruits do not contain it, and even the berries of the lauro-cerasus may be eaten with impunity, while the distilled water and oil of this plant are the most destructive of all narcotic poisons.

‡ Gay Lussac, in the preparation of this acid, exposes the bi-cyanide of mercury, with two-thirds of its weight of muriatic acid, to a moderate heat in a glass retort. Corrosive sublimate is formed, and the hydrogen of the

nature of this acid was not ascertained; at that period Gay Lussac discovered its real chemical constitution to consist of a peculiar gaseous and highly inflamed compound of carbon and nitrogen, to which the name of cyanogen was applied, and hydrogen, the latter acting as the acidifying principle, whence the term Hydro-cyanic Acid.* It is thus composed of 44.39 parts of carbon, 51.71 of nitrogen, and 3.90 of hydrogen. It is a colourless transparent liquid, sometimes presenting a yellow tinge, with a bitter and peculiar *taste*, and an *odour* resembling that of bitter almonds. The specific gravity at 45° is .7058; but it cannot be kept for any length of time, as it rapidly undergoes decomposition. When employed in medicine, according to Schcele's preparation, under the term of Acidum Hydro-cyanicum *dilutum*, it is of the specific gravity of about 0.996.

Medical Use, &c.† The medicinal acid (according to Majendie) contains one part of the acid of Gay Lussac, and eight parts and a half of water by weight, or one part of the acid, and six parts of water in volume. In this form it is an invaluable agent as a sedative and antispasmodic in cases of pulmonary and other inflammations, in doses of three or four drops twice a day; it may also be administered in cases of spasmodic cough, and in dyspeptic affections in the same quantity. As a local remedy, the hydro-cyanic acid has been used with success in the cure of cutaneous diseases, especially those of an impetiginous nature, in the proportion of 3i of the diluted acid to ʒiiss of rose-water.

Symptoms when taken in excess. If taken in a considerable quantity, life is instantly destroyed by its overpowering effect upon the nervous system; should less than eight or ten minims be swallowed, the *primary symptoms* are stupor and vertigo, accompanied by nausea and fainting; the vision is obscured, and slight difficulty of respiration is experienced. *Secondary*—Violent vomiting of a dark-coloured

decomposed muriatic acid combines with and converts the cyanogen of the cyanide into hydro-cyanic acid; it is disengaged in the gaseous form, and condensed in a receiver kept cold by snow or pounded ice, the vapour of the acid being transmitted through a tube containing fragments of marble and well dried chloride of lime, in order to retain the small portions of muriatic acid and watery vapour that pass along with it, the marble attracting the former and the chloride the latter.

In Vauquelin's process, the bi-cyanide of mercury is introduced into a glass tube, and exposed to a gentle heat, one end of which is connected with a tubulated retort containing diluted sulphuric acid and sulphuret of iron. In this manner sulphuretted hydrogen is slowly disengaged and brought in contact with the bi-cyanide; both these compounds are decomposed, the hydrogen of the former combining with the cyanogen of the latter, forming hydro-cyanic acid, which must be collected in a receiver kept very cold; the sulphur remains in combination with the mercury.

* See the Journal of the Royal Institute of France for 1815.

† The use of this acid in medicine is ably considered by Dr. Granville, in a work entitled "An Historical and Practical Treatise on the use of Prussic Acid. London, 1820."

and bloody matter ; dilated pupils ; the respiration rendered more difficult ; cold clammy sweats ; small and irregular pulse ; gradual prostration of strength ; insensibility ; death.

Cause of Death. This acid exerts its powerful and deadly influence by its action upon the nervous system, and when taken in a large dose, acts too rapidly to permit any effects to be extended to the respiratory or circulatory organs.

Morbid Appearances. If an examination of the body take place very soon after death, a strong odour, similar to that of bitter almonds, is perceptible, especially upon opening the cavities ; but in other cases there are no appearances to be recognised throughout the course of the intestinal canal, in the lungs, or the brain, by which we can detect the action of this poison. In a case reported by Hufeland, the pia-mater and vessels of the brain were filled with blood ; the stomach was highly inflamed, and presented gangrenous spots of the size of a sixpence ; the villous coat separated on the slightest pressure of the nails ; all the blood was collected in the veins, whilst the arteries were empty, and it was generally of a black-blue colour, fluid, yet thick like oil, and had a most penetrating smell of bitter almonds.* These, however, must not be regarded as usual circumstances in cases of poisoning by prussic acid ; the manifestations are in general feeble, and not to be relied upon.

Remedies. If the concentrated acid have been swallowed, all attempts at relief will prove in vain. In those instances where the weak acid, or any of the plants, &c. that contain the principle of this poison, have been administered by carelessness or design, the first steps must tend to restore the nervous energy that has been so severely depressed ; for this purpose the liquid ammonia, camphorated mixture, oil of turpentine or spirits and water, may be given as each can be the most readily procured, continuing the doses until the system betray some signs of returning vigour. It is questionable how far the practice of diluting the poison, or exciting vomiting by copious draughts of fluid, is justifiable ; the creation of nausea stimulates the absorbents, and as it frequently happens that the vital power is too much subdued to permit the evacuation of the contents of the stomach, the absorption of the acid is rendered still more certain. Solutions of chalk and magnesia, in as little water as possible, have been recommended ; but the operation of stimulants appears to promise the most reasonable prospects of success in counteracting the influence of this deadly sedative poison.

* M. Robert, in examining a dog that had been poisoned by prussic acid, found that the brain was healthy in appearance, but exhaled the odour of prussic acid. The tongue was soft, bluish, and hung out of the mouth ; the mucous membrane of the trachea was preternaturally red ; the lungs were of a bright-red hue, and the heart was filled with very dirty deep-red blood ; the veins contained thick and dark-coloured blood ; the lungs and heart exhaled the odour of prussic acid.

Rationale. It is only necessary, under this head, to observe that the solutions of chalk and magnesia are supposed to act in conjunction with the prussic acid, in the formation of the prussiates of lime or magnesia, either of which is insoluble and inert.

Tests. Difficult as it may be to recognise the effects of this poison on the system, we are yet enabled to detect the most minute portion of it by chemical means. One ten thousandth part of prussic acid in water, may be discovered by the addition of a few drops of a solution of the sulphate of iron, a dark brown precipitate occurring; if a few drops of sulphuric acid be poured on this precipitate, it instantly turns to a bluish green, which gradually deepens to a full blue colour. Lassaigne, however, adopts a still more delicate test, capable, as he asserts, of tracing $\frac{1}{200000}$ part of prussic acid in water. Into the liquid containing the acid, which he first renders slightly alkaline by the addition of a small quantity of potass, he introduces a few drops of a solution of the sulphate of copper, and afterwards sufficient muriatic acid to re-dissolve the excess of oxide of copper. A cloud-like appearance is then occasioned, which is more or less turbid or milky, according to the quantity of prussic acid present. It has been recommended, in examining the bodies of those suspected of being destroyed by prussic acid, to collect the blood contained in the ventricles of the heart, a portion of the contents of the stomach and of the duodenum, together with any fluid that may be found in the head, chest, or abdomen, agitating them for some time in distilled water, and then filtering the fluid before it is submitted to the above tests.*

A white precipitate will be afforded from the nitrates of silver and mercury, if a small portion of the contents of the stomach containing prussic acid be mixed with them; but these tests are too uncertain in their operation to be relied upon, and especially when we can command superior agents in the detection of the poison.

It is necessary to observe, with reference to prussic acid, that considerable stress has lately been laid on a preparation of chlorine as an antidote, and it has repeatedly been asserted, that Monsieur Chabert, usually denominated the Fire King, employs that preparation in his experiments upon dogs, and after self-administration of the poison. Whatever the remedy used by Monsieur Chabert may be,

* Lassaigne injected into the œsophagus of a cat twelve drops of pure hydrocyanic acid, diluted with sixty drops of distilled water; the animal immediately appeared weak, the respiration became slow, there were slight convulsions of the limbs, and it died *one minute* after the injection of the poison. At the moment of its death, a vapour came from the throat, smelling strongly of prussic acid; and a paper moistened with alkali, when held to it, was afterwards rendered blue by persulphate of iron. The stomach was cut into pieces under water, and both the stomach and water were put into a retort, and subjected to heat; when about one-eighth of the liquid was distilled, it was submitted to chemical examination, and by using the copper test described in the text, prussic acid was readily detected.—*London Lancet*, Aug. 16th, 1828.

it is certainly efficacious, as many animals to whom he has given the acid, have speedily recovered from its effects under his care. M. Labarraque has of late years prepared a solution of the chloride of sodium, which has met with a ready sale both in Europe and this country as an antiseptic and disinfectant. In the event of poisoning by prussic acid, this solution may be tried in repeated doses, and its qualities as an antidote fairly proved.

PHOSPHORUS.

Some doubt is entertained how far this inflammable substance can be considered a poison. Administered as a medicinal agent, we are aware that it possesses extraordinary stimulant powers, and it has in consequence been presumed more from analogy, perhaps, than experiment, that an overdose would be attended with a fatal result; but from the exhibitions of Monsieur Chabert and others, it would appear that the system will permit the introduction of a very considerable quantity without injurious excitement, and consequently that our fears, in the employment of phosphorus as a stimulant, have been greatly magnified.

It is, however, not improbable that in some habits the administration of this substance might produce some of the effects attributed to it, and which have been described as violent pains in the stomach and bowels, with a hot and alliaceous taste in the mouth, great excitement of the arterial system, and convulsions.

Under such circumstances, it would be proper to dilute the stomach with fluid in order to induce vomiting; and if a magnesian solution were employed, it might tend to neutralize the phosphorus and phosphoric acid, which would be rapidly formed in the stomach by oxygenation.

If death occur from an overdose of this substance, we shall in all probability discover an inflammatory appearance of the stomach and intestines, with sphacelated spots in various parts.

The only *tests* that we can propose for the detection of phosphorus, are the peculiar alliaceous smell of the contents of the stomach evacuated before or collected after death, and the inflammable nature of any particles of the substance that may be discovered.

THE STOMACH PUMP.

For the purpose of avoiding repetition in an elementary work, all allusion to this invaluable instrument in the treatment of cases of poisoning, has been hitherto refrained from; its use is, however, applicable to each instance, whether of a mineral or alkaline salt, of

mineral or vegetable acid ; nor is it less valuable in those examples where poisonous plants or animal substances have been swallowed, or, in fact, whenever the system is suffering from the presence of deleterious matter in the stomach. There are four indications to be answered in the employment of this instrument : 1st. The evacuation of the contents of the stomach, either by the passage of an emetic, or such a quantity of liquid as will ensure vomiting : 2d. The dilution of poisonous fluids to such an extent as to render them comparatively harmless : 3d. The introduction of antidotes that shall neutralize the poison : and 4th. The administration of cordials and stimulants, particularly in cases where narcotic poisons have been swallowed, when the stomach is in a state of torpor, and with difficulty acted upon by the most potent emetics.

It may always be advisable in those instances where excessive vomiting has not already taken place, to arouse the stomach into vigorous action by such emetics as are directed under the appropriate heads, and to continue their effects until the evacuated contents present no suspicious appearances ; where the sufferer has been much weakened by the sickness induced by the poison, such means should be adopted as will tend to the decomposition of the remaining portion ; and in those cases, where from convulsions it is impossible to pass the tube into the stomach by the mouth, it may be safely introduced into the œsophagus through the nostril.

Perhaps in no instance is the use of the stomach pump so clearly recognised as when opium or other narcotic poisons have been swallowed ; all fluid preparations may be immediately diluted, and their effects greatly checked, even should the stomach refuse to part with its contents ; and the nervous energy re-animated by stimulants, until the torpor of the system be relieved.

The admirable effects of the stomach pump therefore must recommend it to general adoption : since its invention many individuals have been rescued from the guilt of suicide and the base attempts of others, and by a process so easy of execution, and so expeditious in its usefulness, as to bring it within the ability of every intelligent individual, and almost at a moment's warning.

VEGETABLE POISONS.

OPIUM ;

The concreted milky juice of the capsule of the white poppy (*Papaverum somniferum*,) an annual plant of the class Polyandria, and order Monogynia, which attains the highest perfection in Turkey and the southern parts of Europe, although a large supply of inferior quality is annually obtained from the East Indies.

The Turkey opium is procured in the form of flat pieces of a solid compact texture, plastic, and of a reddish-brown colour, having a nauseous and bitter taste, and a peculiar heavy and narcotic odour.

Chem. Composition. Resin, gum, bitter extractive matter, sulphate of lime, gluten, narcotine,* and a peculiar alkaline principle, to which the soporific virtues of opium are owing, termed Morphia. It moreover appears, that this new alkaline body exists in combination with an unknown acid, which has been denominated the Meconic Acid ; so that the narcotic principle of opium is morphia, in the state of a meconiate, or perhaps of a super-meconiate. (Paris.) Opium is partially soluble in water, alcohol, æther, wine, vinegar, and lemon-juice ; when triturated with hot water, five parts in twelve are dissolved, six suspended, and one part remains perfectly insoluble, and resembles gluten. For medical purposes, spirit, rather below proof, is its best menstruum. Specific gravity of the drug, 1.336.

Medical Use, &c. When administered in small quantities, its operation is stimulant ; but in its usual doses, from gr. i to grs. iii, it becomes sedative and narcotic. In all cases of pain and restlessness, where acute inflammation does not prevail, the use of opium is admissible, and in diarrhœa, dysentery, or cholera, and all convulsive and spasmodic diseases nearly indispensable. The most usual preparation of the drug, is its spirituous tincture or laudanum ; a watery infusion, made by pouring boiling water upon powdered opium, is also frequently employed, and with this advantage, that it does not create that peculiar nausea and distress resulting from the use of opium in substance or laudanum. The celebrated black drop,

* Derosne first obtained a crystalline substance from opium in 1803, which was carefully analyzed by Robiquet in 1818, who pointed out the error of considering it as one of the salts of morphia. Narcotine is, in fact, an azotized substance, crystallizing in pearly prisms or tables ; soluble in fixed oil, and still more so in æther and the acids ; insoluble in water, and but slightly soluble in alcohol ; destitute of action on the vegetable colours, and incapable of neutralizing acids.

or the Lancaster or Quaker's black drop,* is sometimes preferred to all other preparations, as operating with more certainty in procuring sleep without any unpleasant after-effects.

The sulphate and acetate of morphia have of late years been extensively employed, particularly in the French hospitals; when properly prepared, they exert an active influence in allaying pain and irritation, and are never followed by sickness and stupor. Their proportion, in respect to crude opium, is a quarter of a grain for a grain. As a local application, the watery infusion of opium is sometimes recommended as an injection in gonorrhœa and spasmodic stricture, as an adjunct to clysters in diarrhœa, and mixed with oil for friction to the spine in tetanus.

Symptoms when taken in excess. When a very considerable quantity of opium, or any of its preparations, have been swallowed, the primary symptoms are scarcely discernible, so instantly depressed are the powers of life; the sufferer is overcome with drowsiness and stupor, from which the most violent stimulants fail in arousing him; low muttering delirium and stertorous breathing succeed; and cold sweats and convulsions announce the approach of an apoplectic death. Where the dose has not been so great, the symptoms are, of course, of a milder character; the countenance is pale and contracted; the pulse feeble and irregular; a stupor prevails, in which the frequent sighing of the patient is remarkable, and appearances *gradually* become more alarming, if remedies be not promptly administered.

Cause of Death. The exact mode by which opium exerts its fatal influence on the system, is still a matter of dispute. It probably acts in two ways; through the medium of the nerves by rapidly diminishing the sensorial energy, or by absorption through the medium of the circulation; in the first instance, it would destroy by suffocation, from a paralysis of the respiratory muscles; in the second, by inducing apoplexy when determined to the brain, or paralysis and syncope when extended to the heart.

Morbid Appearances. The pathological evidence of poisoning by opium is exceedingly weak; in numerous instances not the slightest lesion can be detected in the viscera of the thorax or abdomen; and in others, when the poison has entered the circulation by absorption, having failed of its direct effect upon the nervous energy, the slight inflammation observed of the stomach and intestines, supplies us with

* The black drop is thus prepared: "Take half a pound of opium sliced, three pints of verjuice (or juice of the wild crab,) one and half ounce of nutmegs, and half an ounce of saffron; boil them to a proper thickness; then add a quarter of a pound of sugar and two spoonsful of yeast: set the whole in a warm place near a fire for six or eight weeks; then place it in the open air until it becomes a syrup; lastly, decant, filter, and bottle it up, adding a little sugar to each bottle. An acetate of morphia is thus formed, one drop of which is equal to three drops of the common tincture of opium."

but slender testimony in accounting for death. The brain will sometimes present a blush of inflammation on the arachnoid membrane, and there may be more bloody spots distributed through its substance than usual, or a slight effusion into the lateral ventricles; but, in the majority of cases, even this organ is free from any morbid appearances.

Remedies. Administer, instantly, a powerful emetic, consisting of 20 grains of the sulphate of zinc, or 6 grains of the sulphate of copper, dissolved in an ounce of water; the fauces should also be irritated, and the stomach afterwards excited to vomiting by copious and repeated draughts of warm water. In those cases, where excessive stupor prevails, and the stomach obstinately resists the action of the most potent emetic, from the depression into which the whole system is thrown, the use of the stomach pump affords the only chance for the preservation of life. When, by any means, the stomach has been evacuated of its contents, water, acidulated with vinegar or lemon-juice, may be supplied, and strong coffee, or a solution of the carbonate of ammonia, as stimulants. The most active measures must likewise be adopted to arouse the sufferer into consciousness; such as walking him up and down the apartment; the application of mustard plasters, or the oil of turpentine, to the surface as irritants; the use of the tepid bath, and continued friction; to all of which some practitioners have added severe flagellation.

Rationale. The exhibition of the acids, when the stomach has been cleansed, tends to lessen or remove the stupor occasioned by the opium; but, if administered previously, they are improper, as favouring its rapid solution, and, consequently, its readier absorption.

Tests. Liquid ammonia is, perhaps, the only test that can be relied upon in the detection of opium; upon adding it to any fluid containing this drug, or its preparations, a small precipitate is thrown down, consisting of morphia or the active principle of opium; should the poison have been administered in porter or beer, this precipitate will be accompanied by a greyish-brown powder of considerable bulk, insoluble in water and alcohol, but readily soluble in nitric acid, and which is probably some form of Hordein;* this may be separated from the alkaline principle of the opium by boiling alcohol, and upon evaporation of such alcoholic solution to dryness, a minute pellicle of morphia will be the residue, which, if touched with a drop of nitric acid of the specific gravity of 1.3, will assume the charac-

* Hordein is a principle existing in barley, and is obtained from its flour, by treating it first with cold and then with boiling water. The former abstracts all the mucilaginous matter; the latter dissolves the starch, and leaves the hordein. It is insipid, insoluble, and of a yellowish colour. Nitric acid converts it into oxalic and acetic acids; and during the process of melting, it is in a great measure decomposed, being converted into starch and sugar.

teristic blood-red tint, and acquire the peculiarly bitter taste of morphia. (Ure.)

The most convincing test, perhaps, of the presence of opium, is the strong narcotic odour of the stomach, if an early examination of the body be procured.

NIGHTSHADE, OR DWALE.

(*Atropa Belladonna*, or the *Belladonnæ Foliæ of Medicine*.)

A perennial plant of the class Pentandria, and order Monogynia, every part of which is an acrid-narcotic poison, the leaves, however, being the most powerful. The berries are large, round, and of a deep purple colour, and the flower small, and likewise of a purple hue.

Chem. Composition. The leaves in particular contain a substance analogous to albumen, salts with a base of potass, and a bitter principle on which its narcotic properties depend. Vauquelin likewise discovered the presence of an alkaline element in the leaves of this plant, which has been termed Atrophia, and in which its essential qualities reside. From this element a sulphate is prepared, which crystallizes very beautifully. Water is the most powerful solvent of the active matter of this plant; and its infusion, as well as its watery extract, are accordingly employed in medicine. The leaves and berries have a nauseous, sweet, and slightly acid taste, and are *inodorous*.

Medical Use, &c. Sedative, narcotic, and diaphoretic in operation, and occasionally employed in the treatment of obstinate intermittents, tie-doloureux, palsy, epilepsy, pertussis, and amaurosis, in doses of half a grain gradually increased to three grains of the powdered leaves; to ℥ij of the infusion prepared from ℥j of the leaves to 3x of hot water. Of the extract, half a grain increased to five grains may be given in similar cases. Externally, the powder of the leaves is sometimes sprinkled over cancerous sores, or applied as a poultice; and the extract is smeared over the eyebrow in cases of neuralgia, or in iritis, and previously to an operation for cataract, for the purpose of dilating the pupil.

Symptoms when taken in excess. *Primary*—A sense of dryness and difficulty of dilating the œsophagus in the act of swallowing; sickness and vertigo; violent headache, especially over the orbits; and a redness of the eyes, with dilatation of the pupils. *Secondary*—Each particular circumstance increased; violent pain and heat in the throat; delirium and convulsions, and, in some cases, an intense uniform redness over the whole surface; to these symptoms may be added a very painful irritation of the urinary passages, especially of the neck of the bladder, with a constant but fruitless desire of micturition; coma at length supervenes, under which the sufferer sinks.

Cause of Death. This poison may be said to have a threefold action ; it is evidently absorbed and carried into the circulation from the effects produced upon the sensorium ; is capable of exerting some slight local action on the bowels, and is likewise determined to the nervous system, as proved by its influence upon the pupils of the eyes.

Morbid Appearances. The body is usually swelled, and rapid putrefaction follows death ; the vessels of the brain are turgid with blood, and the membranes highly vascular ; the stomach and intestines present some slight appearances of inflammation, and the fauces and œsophagus are intensely red, and sometimes thickened.

Remedies. Administer the powerful emetics recommended under the head of opium, although the stomach is so early and so severely affected by this narcotic as to render them useless, when the stomach pump presents the only means of treatment. Large doses of vinegar and water, lemon-juice, or other vegetable acid, may be given ; and in those cases where the system is but partially subdued, the emetics, that were previously inert, will act vigorously after their administration. The patient may be exposed to the shock of a shower-bath, or cold water may be plentifully poured over him ; the abdomen should be fomented, and the bowels stimulated by active cathartics and enemata ; and, after vomiting has been freely excited, venesection may be practised, and leeches applied to the hypogastrium. It would be unwise to abstract blood so long as the stomach refused to part with its contents, as absorption would thereby be rendered more certain.

The *Rationale* of this treatment is the same as that described in cases of poisoning from opium.

NUX VOMICA.

The seed of the *Strychnus Nux Vomica*, a tree of the class *Pentandria*, and order *Monogynia*, is an acrid-narcotic poison of the utmost virulenc. The whole tribe of plants, to which this variety belongs, including the Upas of Java, St. Ignatius' Beans (*Faba Sancti Ignatii*), and the Snake-wood (*Strychnos Colubrinum*), possess the active principle so remarkable in *Nux Vomica*.

Chem. Composition, Character, &c. The seed of the fruit or the berry of this tree, is flat, round, about an inch broad, and nearly a quarter of an inch thick, with a prominence in the middle on both sides, of a grey colour, covered with a woolly substance. Internally, it is hard and very tough. Its essential constituents are gum, bitter principle, resin, and a peculiar alkaline substance, discovered by Pelletier, to which the name of Strichnine has been applied ; a second alkaline principle was also detected, termed Brucine, which had been previously found in the spurious *Angustura* bark. The readiest mode of preparing strychnine, is by boiling *Nux Vomica* in water,

and evaporating the decoction until it acquires the consistence of syrup; lime is then added, which unites with the acid, and liberates the strichnine, which may be separated by means of alcohol, and obtained therefrom by crystallization. (Paris.) The mode by which the principle was obtained by Pelletier, differed in the use of the sub-acetate of lead instead of the lime, and being somewhat more complicated in the process. Strichnine thus formed, consists of very small four-sided prisms, terminated by four-sided pyramids; its *taste* is extremely bitter, with a slight metallic flavour, and is *inodorous*. It is readily *soluble* in alcohol, but requires 6667 parts of water at 50° and 2500 at 212° to dissolve it. Majendie states that $\frac{1}{3}$ of a grain is sufficient to kill a large dog, and that $\frac{1}{4}$ of a grain has a very sensible effect upon a healthy man.

Medical Use, &c. The Strichnine has been chiefly employed in Germany, in the treatment of cases of mania, epilepsy, paraplegia, serophula, prepared in pills (dose $\frac{1}{12}$ of a grain) in alcoholic tincture, (formed by adding three grains of Strichnine to an ounce of alcohol, of which, from 6 to 15 drops may be given) or in mixture, (made by the addition of two grains to six ounces of fluid, taking one drachm night and morning.)

Symptoms when taken in excess, either of the Nux Vomica or Strichnine. *Primary*—Dizziness and stupor; wandering of the intellect; and a violent twitching of the muscles of the extremities. *Secondary*—Continued spasms of the extremities, which are soon extended to the muscles of the chest, occasioning hurried and laborious respiration; trismus or locked jaw ensues, with a rigidity of the limbs, ushering in the approach of confirmed tetanus, ending in asphyxia and death.

Cause of Death. This poison exerts its influence upon the spinal marrow without any direct interference with the functions of the brain occasioning dissolution by as well-marked a tetanus as in a traumatic case.

Morbid Appearances cannot be detected in the stomach or intestines, and the lungs and the brain are perfectly unaltered; in some cases, the left ventricle of the heart has been found gorged with blood, but even this is an unusual circumstance, and it may be said that no light is thrown upon an instance of poisoning by this substance, in pathological examination. In common, with cases of traumatic tetanus, the medulla spinalis presents no traces of extraordinary action, nor indeed any morbid indications.

Remedies. All that can be done after an evacuation of the contents of the stomach by emetics or the stomach-pump, is to administer strong acidulous drinks. When the tetanic symptoms are fairly set in, they may be treated as in a case of tetanus, by calomel and opium in addition to the other measures required in such disease; but the records of medicine unhappily supply but few instances of success.

ful practice. The *rationale* for this limited treatment is sufficiently plain. There are no *Tests* by which the presence of this poison can be ascertained.

DIGITALIS, OR FOX-GLOVE.

The name applied to the leaves of the *Digitalis Purpurea*, a biennial plant of the class *Didynamia*, and order *Angiosperma*. The peculiar properties of this plant reside principally in the leaves, which are of a lively green colour; the flowers are long and pendant, and of a beautiful reddish-purple hue.

Chem. Comp. Character, &c. The constituent parts of the leaves of *Digitalis* may be said to consist of extractive matter, a green resin, and a peculiar active principle, termed digitaline, discovered by M. Leroyer, by digesting the plant in æther, and adding to the solution the hydrated oxide of lead; this precipitates the alkaline base, which crystallizes after very careful evaporation. The qualities of the leaves are readily parted with, both to water and alcohol; they have a bitter, nauseous, and slightly acrimonious *taste*, and yield rather a heavy and acrid-narcotic *odour*.

Medical Use, &c. In operation, sedative, diuretic, and narcotic, and of the utmost value in many inflammatory diseases; in dropsies, unattended by visceral disorder, and in those cases where excessive action of the heart prevails. It may be administered in substance, (gr. j in pill, twice a day) in tincture, (ten minims) or in infusion, made by macerating 3j of the leaves in half a pint of boiling water for four hours, (3i every eight or twelve hours.) These doses may respectively be increased, at the rate of one fourth every second day, until the effects become apparent, either in the increased secretion of urine or the production of slight nausea, when its use must be more cautiously regulated. The employment of digitalis is incompatible with the sulphate of iron, the acetate of lead, and the infusion of yellow cinchona bark.

Symptoms when taken in excess. *Primary*—Extreme nausea; vertigo; and indistinct vision; tremors; chilliness; and stupor. *Secondary*—Violent sickness; continued hiccough; cold sweats, accompanied by excessive debility; syncope; delirium; convulsions; death.

Cause of Death. Digitalis acts as a powerful and direct sedative, diminishing the arterial action, and thereby operating through the medium of the circulation upon the heart and lungs.

Morbid Appearances. The stomach and intestines are seldom observed in a state of extraordinary vascularity, proving the slight local action of this poison. It has been observed, that the blood found in the ventricles of the heart is generally in a fluid state, and the lungs more than usually crepitant; but in common with other cases of poisoning by vegetable substances, the appearances are deceptive, and not entitled to great attention.

Remedies. Every effort should be made to arouse the vital energy, and for this purpose, spirits and water, the aromatic confection, the liquid ammonia, strong coffee, &c. may be freely supplied, applying at the same time a blister to the pit of the stomach, and mustard cataplasms to the soles of the feet. The use of opium, in moderate doses, has likewise been recommended.

Rationale. It is sufficiently evident that the cordial plan of treatment tends to counteract the debilitating nature of the poison, and to restore a tone to the languid circulation. If opium be of any service, it is probably in small doses, when it will act as a stimulus; but great care is necessary in its employment, or it may increase rather than arrest the evil. There are no *Tests* by which the presence of digitalis can be ascertained.

TOBACCO.

(*Nicotiana Tabacum.*)

An annual plant of the class Pentandria, and order Monogynia, the leaves of which, although possessing poisonous qualities, extracted by infusion, or by distillation when a powerful essential oil is procured, are freely made use of nearly in every country, by taking snuff, and chewing or smoking the leaves.

Chem. Comp. &c. This consists of mucilage, albumen, gluten, extractive matter, a bitter principle, an essential oil, nitrate of potass, which occasions its deflagration, muriate of potass, and a peculiar proximate principle, upon which its properties are supposed to depend, termed Nicotin, which Vauquelin considers as approaching the volatile oils in its properties; it is colourless, has an acrid taste, the peculiar smell of tobacco, and occasions violent sneezing; with alcohol and water, it produces colourless solutions, from which it is thrown down by tincture of galls. (Paris.) Tobacco is *soluble* both in water and spirits, but particularly in the latter; an oil of a most powerful nature may be procured by distilling the infusion of the leaves, and separating it from the water on which it will float. The leaves have an acrid and bitter *taste*, and a strong and narcotic *odour*.

Medical Use, &c. Powerfully sedative in operation; emetic and subsequently cathartic, and diuretic. It is, however, but seldom employed, from its uncertain and violent effects, except when it is desirable to relax the system suddenly, for the purpose of reducing a strangulated hernia, or returning a dislocated bone, when an infusion of the leaves (in proportion of 3i to a pint of boiling water) may be injected into the rectum. Tobacco has, notwithstanding, been employed as an external application by some practitioners, in the form of a cataplasm to the pit of the stomach in inflammatory attacks, or in that of infusion in *tinea capitis* and cutaneous diseases; but its ad-

ministration, either externally or internally, is nearly always followed by alarming symptoms of prostration.

Symptoms when taken in excess. *Primary*—Nausea ; severe vomiting and headache. *Secondary*—The whole appearance of the sufferer resembles that of a man violently affected by spirituous liquors ; the nervous and muscular energy become more depressed ; cold and clammy sweats ensue ; and convulsions precede dissolution.

Cause of Death. The oil of tobacco differs essentially in its physiological action from the infusion, the former affecting the brain only, and the latter when taken into the stomach, and received through that medium into the circulation, suspending the action of the heart, and causing death from syncope. (Brodie.)

Morbid Appearances. In general, these are very obscure ; the stomach and intestines appear but slightly or not at all affected ; nor does the brain present any signs of vascularity. In some instances the lungs are found gorged with blood.

Remedies. Administer promptly two or three grains of tartar emetic, assisting its operation by repeated draughts of warm water ; if some time have elapsed since the tobacco have been swallowed, a brisk cathartic may be preferred, and perhaps the croton oil, from its rapid action, is the best ; lemon-juice or vinegar and water should afterwards be supplied, and if the sedative effects continue, spirits and water, the camphorated mixture, or the solution of the carbonate of ammonia.

The *Rationale* of this treatment, after the tobacco has been expelled from the stomach, is in meeting its narcotic effects by the vegetable acids, and in directly opposing its sedative qualities by the administration of cordials.

HENBANE.

(*Hyoscyamus.*)

A biennial plant of the class Pentandria, and order Monogynia, the leaves and seeds of which are used in medicine.

Chem. Composition, &c. Resin, mucilage, extractive matter, gallic acid, some salts, and an alkaline element, termed Hyoscyama, in which the virtues of the plant principally reside. *Solubility*—Water readily extracts the narcotic properties of this plant by infusion, but totally dissipates them by decoction. Alcohol, however, is the readiest solvent. When freshly gathered, the flowers and leaves of henbane have a strong and fœtid odour, and an insipid and glutinous taste ; the qualities are greatly lost by exposure to the air.

Medical Use, &c. Narcotic and antispasmodic, when internally employed, in the treatment of epilepsy, hysteria, palsy, and schirrhous—of the powder of leaves, from three to ten grains may be given ; but the usual form of its administration, is the extract or inspissated

juice, of which five grains, gradually increased to one scruple, may be administered. Externally, the powder of the leaves are sometimes sprinkled on cancerous sores, or a cataplasm is prepared from the recent leaves themselves, in order to allay pain. The principal design in the medical use of this plant or its extract, is to afford a powerful narcotic when the employment of opium is prohibited; and it has this advantage over the drug—that it usually relaxes the bowels. The use of henbane is incompatible with the administration of the acetate of lead; the nitrate of silver, the sulphate of iron, and the vegetable acids likewise, have some effect in weakening its qualities.

Symptoms when taken in excess. Primary—Extreme sickness; lassitude, and stupor; dimness of sight, and a hard and quick pulse. *Secondary*—Dilatation of the pupils; the pulse loses its previous character, and becomes weak and irregular; delirium sets in, followed by coma, and in many cases petechiæ appear before death.*

HEMLOCK.

(*Cicuta vel Conium.*)

An annual plant of the class Pentandria, and order Dygynia; of which the leaves and seeds are employed in medicine.

Chem. Composition, &c. Gum, mucilage, a bitter principle, and a resinous element, in which the virtues of the plant consist, termed *Concin*; this may be obtained by the evaporation of an ethereal tincture, made with the leaves; it has a rich dark colour, and imparts the peculiar taste and smell of hemlock. A dose of half a grain will occasion vertigo. The qualities of hemlock are readily extracted by alcohol and æther; but its watery extract possesses but little activity.

Medical Use, &c. Narcotic, sedative, and antispasmodic in operation; administered internally in cases of pulmonary irritation, and as a palliative in cancerous and scrophulous sores, in doses of the powder of the leaves, (which should be of a lively green colour,) three grains gradually increased to one scruple. The extract or inspissated juice is, however, usually prescribed, gr. v to ℥i twice or thrice a day, continuing its use until a slight nausea and giddiness is produced, together with a relaxation of the bowels. Externally, the leaves are used in the form of cataplasm or fomentation to irritable ulcers, and with considerable advantage.

Symptoms when taken in excess. Primary—Nausea; violent sickness; difficulty of respiration; and excessive anxiety. *Secondary*—

* The cause of death, morbid appearance, and remedies, being similar to those occasioned and required in cases of poisoning by hemlock, hellebore, colchium, and savine, they will be considered collectively under the last head.

Vertigo ; delirium ; sometimes great dilatation of the pupils ; stupor ; convulsions and death.

HELLEBORE.

There are two species of Hellebore employed in medicine ; the root of the White Hellebore (*Veratri Albi Radix*;) and that of the Black Hellebore (*Hellebori Nigri Radix*;) each of which we shall consider ; and first of the *White Hellebore*. This is a shrub of the class Polygamia, and order Monœcia, the properties of which reside in the root. It is of a greyish-brown colour when powdered ; has a bitter and acrid taste, and a strong and offensive odour.

Chem. Composition, &c. It consists of wax, fecula, a bitter principle, and a peculiar alkaline element, termed, by its discoverers, Pelletier and Caventou, Veratrine, and which is met with in all the plants of the veratrum tribe. This peculiar substance is, at first, of a yellowish colour ; but, by repeated solutions in alcohol, and precipitating it afterwards by the addition of water, it is obtained as a white crystalline powder, of an acrid taste, and inodorous. It is very slightly soluble in cold water. Boiling water dissolves $\frac{1}{100}$ part of its weight, acquiring a sensible sharpness. By several experiments made on animals with this substance, it appears that unless it be administered in very large doses, or applied to parts where it would be readily absorbed, its effects are local, occasioning violent irritation and subsequent inflammation. The mucous membrane of the stomach and intestines, in every case displayed the active nature of the irritant. When administered in a considerable quantity, the respiration was greatly accelerated, and tetanic symptoms quickly supervened.

Medical Use, &c. The root of this plant is extremely violent in its effects on the animal economy ; it was well known to the ancients, but never resorted to unless in a case where a violent emetic and cathartic were necessary, and when other remedies had failed in producing any effect. It is now scarcely ever employed, except in cases of mania, when it is desirable to occasion a sudden and violent determination to the stomach and bowels ; with this object in view, two grains may be administered. As an errhine, which is its most ordinary use, from three to five grains may be mixed up with twelve times its weight of starch, and a pinch taken for several successive evenings ; great caution is, however, required in such a use of the powdered hellebore, as fatal hæmorrhages from the nose, and from the uterus of pregnant women, have sometimes followed its exhibition. An ointment is occasionally prepared, by mixing two ounces of the powder with eight ounces of lard, or an infusion of the root employed, in the cure of scabies and herpetic eruptions. M. Majendie reports a case in which he administered the very considerable dose of two

grains of veratrine in the course of twenty-four hours to an old man labouring under apoplexy ; under the depressed state of the nervous system, this quantity did not occasion very considerable purging, although, in other instances, a quarter of a grain produced violent catharsis. Upon a review of the reports furnished by M. Majendie, relative to the use of veratrine, it appears that it may be advantageously employed, in carefully regulated doses, in relieving old people from the costiveness that so frequently prevails ; it may be administered in pills, making half a grain suffice for six, and of which three may be given in the day ; in tincture, formed by the addition of four grains of veratrine to an ounce of alcohol, taking from 10 to 25 drops in a draught of any bland fluid, or in a solution of one grain to two ounces of distilled water. An ointment prepared by the addition of four grains to an ounce of lard, may be applied in cases of chronic rheumatism, gout, and anasarca.

Symptoms when the root of the White Hellebore is taken in excess.
Primary—Vomiting, and excessive and bloody dejections ; great anxiety ; tremors ; vertigo ; and a low and feeble pulse. *Secondary*—Cold and clammy perspiration ; acute pain in the abdomen ; the vomiting and purging increased ; syncope ; convulsions ; death.

The effects of veratrine, in an over dose, merely differ from these symptoms in their greater severity.

THE BLACK HELLEBORE.

(*Melampodium.*)

This is a shrub of the class Polyandria, and order Polygna, the fibres of the roots of which are employed in medicine ; these are about the thickness of a straw, of a black colour externally, but white or yellowish within.

Chem. Comp. &c. A volatile oil, fatty matter, resin, wax, a volatile acid, a bitter principle, mucus, alunina, gallate of potass, acidulous gallate of lime, and a salt with an ammoniacal base. Its active principle, unlike that of the white hellebore, is not an alkali. (Paris.) It parts with its qualities both to water and alcohol, but particularly to the latter.

Medical Use, &c. This is one of the oldest roots known in medicine, and is frequently alluded to by the ancient writers as a valuable remedy in mania. At present, it is very seldom employed ; its action, when administered of from gr. x to $\mathfrak{z}\text{i}$, is strongly cathartic ; when employed in the quantity of two or three grains twice or thrice a day, it has been considered as an active emmenagogue, and has accordingly been given in suppression of the catamenia. The official preparations are a tincture of the root (dose, $\mathfrak{z}\text{ss}$ to $\mathfrak{z}\text{i}$) and an extract, the evaporated decoction, (dose, gr. x to $\mathfrak{z}\text{i}$.)

Symptoms when taken in excess. *Primary*—Nausea and vomiting; severe pain in the stomach and bowels; vertigo. *Secondary*—The vomiting increased to an excessive degree; so much so, indeed, as generally to insure an evacuation of the poison; where this is not the case, extreme debility and prostration of strength ensue; delirium sets in, and death shortly succeeds.

COLCHICUM.

Meadow Saffron. (*Colchicum Autumnale*.)

A perennial plant of the class Hexandria, and order Trigynia, bulbous, and bearing a rich purple flower; the essential qualities residing in the bulb and seeds, particularly in the first; an acrid-narcotic poison.

Chem. Composition &c. Gum, starch, inulin,* extractive matter, an essential oil, and a milky juice containing an alkaline element similar to that of the hellebore, in which the active properties of the plant consist. It is readily *soluble* in wine or vinegar; but water fails in extracting its qualities. *Taste*, bitter, hot, and acrid. *Inodorous*, except if very recent, when a faint perfume is yielded.

Medical Use, &c. The wine of the seeds, and the vinegar of the bulb of colchicum, are the most usual preparations; in operation they are diuretic, sedative, narcotic, and cathartic, and have long been deservedly extolled as a remedy in gout, rheumatism, and dropsy, particularly in that variety of the last, termed hydrothorax. Dose of either preparation, from half a drachm to one drachm and a half, or, if the recent powder of the bulb be preferred, from one to five grains may be administered.

The celebrated Eau Medicinale, so frequently employed by the French practitioners, is nothing more than a saturated vinous infusion of the bulb of this plant.

Symptoms when taken in excess. *Primary*—Nausea; vomiting; violent pain in the bowels, and diarrhœa. *Secondary*—The arterial system becomes evidently acted upon; the pulse is feeble, irregular, and sometimes intermittent; cold clammy sweats ensue, and a state of coma, more or less complete according to the quantity swallowed, occurs before death.

* Inulin, or the active principle of the Inula Helenium, or Elecampane, was detected in the Colchicum Autumnale, by Pelletier and Caventou.

SAVINE LEAVES.

(Sabinæ Foliæ.)

From the *Juniperus Sabinæ*, a shrub of the class *Diœcia*, and order *Monadelphia* ; an acrid-narcotic poison.

Chem. Composition. An essential oil, a fixed oil, bitter extractive matter and resin ; the active qualities reside in the leaves, from which they may be separated both by water and alcohol.

Medical Use, &c. In operation, diaphoretic and emmenagogue, exercising an immediate effect on the uterine system, and therefore administered in cases of amenorrhœa, and when the uterus is languid or torpid in its action. Its acknowledged effects as a violent emmenagogue, has frequently supplied unprincipled individuals with the ready means of concealing one crime by the perpetration of another ; but in some instances, and they are by no means unfrequent, the dose employed has been too large, and life has been destroyed by the violent action of the poison.

Its use has been recommended by the German writers, both in chronic rheumatism and for the expulsion of worms ; but in no instance should it be resorted to when much vascular action prevails, as it invariably acts as a potent stimulant, and occasionally induces a violent discharge of blood from the bowels. It is administered in the form of a powder of the leaves, in that of tincture, and as a decoction. Of these, the two latter may be preferred, as the essential oil on which its activity depends, is greatly dissipated by the drying, which is necessary before it can be pulverized. Dose, of the powder, gr. v to x ; of the tincture, ʒi ; of the decoction, ʒss to ʒi. Externally, the dried leaves are applied to indolent ulcers, gangrenous sores, and in the cure of tinea capitis ; or made up in an ointment for the same purposes, and for dressing a blistered surface when it is desirable to keep up a discharge.

Symptoms when taken in excess. *Primary*—Excessive nausea and vomiting ; great heat and pain in the stomach and bowels. *Secondary*—Vomiting and pain increased ; frequent and bloody stools ; great prostration of strength ; intolerable anxiety, occasionally merging into delirium ; convulsions ; coma ; death.

Henbane, Hemlock, Hellebore, Colchicum, and Savine, may be classed together in accounting for their destructive effects upon the animal economy, and in describing the morbid appearances occasioned by their administration in excess, and the remedies that should be employed in an endeavour to counteract their virulent properties.

Cause of Death. These substances act upon the vital organs, through the medium of the circulation, and their effects would probably be the same were they introduced into the system by means

of a wound ; proving, as admitted by M. Brodie in his examination of their qualities, that they are conveyed to the organs of life by the blood, and not through the instrumentality of the lymphatic system. Savine may, perhaps, be partially excepted from this character, as the recent experiments of Orfila appear to show that it exerts somewhat of a local action, but that its mischievous effects depend principally upon its absorption, through which medium it acts on the nervous system, the rectum, and the stomach.

In the majority of cases of poisoning from these plants, the precise determination is to the brain, which, upon examination, is found in the highest state of vascularity ; in every instance the stomach and intestines are inflamed, but rarely in so extensive a degree as to justify the supposition that the local action of the poison upon their membranes has been sufficient to destroy life. Thus the primary effect of these vegetable poisons is upon the circulatory system, and the consequences only are recognised in the viscera.

Morbid Appearances. These are nearly the same whenever death has been occasioned by any of these poisons, although there may be some slight variations in their effects, as well as in the symptoms arising from their employment. In general the stomach and intestines are found inflamed, but seldom ulcerated. When hellebore, hemlock, savine, or colchicum, has been swallowed, the inflammation is usually the most intense in the large viscera, particularly in the rectum, while henbane, on the contrary, seems to exert its influence principally upon the stomach and small intestines. The vessels of the brain are gorged with blood ; the membranes highly vascular ; and numerous bloody spots are observed in the substance of the organ. The lungs are occasionally affected, and discovered in a state of engorgement.

Remedies. Hellebore will frequently prove its own antidote by the vomiting it occasions ; but whenever this effect fails, and in cases where poisoning occurs from hemlock, henbane, colchicum, or savine, an early evacuation of the contents of the stomach must be attempted by administering plentiful draughts of oily or mucilaginous fluids, or by the use of the stomach-pump. The acidulous drinks recommended in cases of poisoning from other vegetable substances, will then be required, together with strong coffee, cordial mixtures, and small doses of opium.

If the use of the lancet be demanded, it must be under the same restrictions as before alluded to ; that is, when the poisonous matter has been discharged from the stomach, in order that its absorption may not be promoted.

The particular actions of some of these substances upon the rectum, may be partially allayed by the continued use of oily and emollient injections.

The *Rationale* of this treatment is too obvious to require explanation. There are no tests by which the presence of these substances can be detected.

AGARICS, OR MUSHROOMS.

Class,	Cryptogamia.
Order,	Fungi.

Among the varieties of this tribe are several of a highly deleterious nature; some sufficiently obvious in their characters to be avoided by all; and others approaching so nearly in appearance and flavour to the genuine and edible mushroom, as to render their identity doubtful. There are, perhaps, no positive marks by which mushrooms, of a harmless or poisonous nature, may be distinguished from each other; but, as a general rule, those plants should be suspected that are found in damp and shady situations, having a dirty looking surface, "with soft and moist gills, a faint, fœtid smell, and covered with a calyptræ or veil." The wholesome varieties may in general be recognised by their firmness and clean appearance, their growth in open pastures, but in particular by the fresh and red colour of their gills (the under surface of the plant disposed in perpendicular laminæ, somewhat resembling the gills of a fish,) and their peculiar, but not unpleasant, earthy odour. The usual varieties of the poisonous Agarics, are the *Agaricus Muscarius* or Bug Agaric, so called from its property of destroying bugs; *Agaricus Piperatus*, or Pepper Mushroom; *Agaricus Bulbosus*; and those known under the names of the Medusa's Head and the Raven's Eye, besides numerous others.

The *Chemical Composition* of these plants would indicate that they make a nearer approach to animal matter than any other vegetables, as they contain, in addition to hydrogen, oxygen, and carbon (the usual components of vegetable matter,) a considerable portion of nitrogen, and yield ammonia by distillation.

The *Symptoms* occasioned by these vegetable poisons are sometimes modified or exasperated according to the varieties of the plants; but, in general, the patient suffers from nausea and vomiting; the bowels are violently acted upon, each dejection occasioning extreme pain, and sometimes a discharge of blood; an ardent thirst prevails; cramps of the extremities ensue, together with vertigo and delirium; the countenance becomes ghastly and anxious; a copious perspiration bedews the whole surface; and a succession of chills and convulsions announce the approach of death.

Upon an examination of the body, every organ appears to have been more or less affected by the action of the poison; the surface of the body is covered with brownish or black spots; the pupils of the eyes are contracted; the cavity of the abdomen inflated with gas; and the mucous membrane of the stomach and intestines in a highly inflamed and gangrenous state; the lungs are gorged with

blood; the liver and spleen similarly circumstanced, whilst the membranes of the brain present appearances of increased vascularity. One extraordinary circumstance remains to be mentioned; the limbs usually retain their flexibility.

The *Cause of Death*, in these cases, may be attributed to both a local action on the mucous membrane of the stomach and intestines, and as acting primarily through the medium of the circulation upon the vital organs.

The *Remedies* proposed must be administered promptly, or they will be of no avail in cases where the living power becomes so rapidly exhausted; the first step taken should be an attempt to evacuate both the stomach and bowels; for which purpose, three or four grains of tartar emetic, or thirty grains of Ipecacuhana, may be mixed in a solution of two ounces of sulphate of soda; the cordial plan of treatment may then come into full operation by the exhibition of doses of sulphuric or nitric ether in mucilage, in small and frequent doses, the carbonate of ammonia, camphor, the tincture of capsicum, or, where these cannot be procured, spirits and water; strongly acidulated drinks may also be given. Where the symptoms of inflammation are acute, the lancet must be employed, but with caution, as the *Rationale* of these remedies consists in supporting the system, and in enabling it to withstand the narcotic and sedative influence of the poison; and, evident as the inflammatory symptoms may be, the primary and deadening effects upon the circulation must be first subdued; the tepid bath, fomentations, and emollient injections, are valuable auxiliaries. No *Tests* have been proposed for the detection of these poisons beyond their botanical characters and the effects they produce upon the system.

ERGOT OF RYE.

(*Secale Cornutum*) or Spurred Rye.

A morbid excrecence, like the spur of a fowl, in the spike of the common rye, or *secale cereale* of Linnæus.

The poisonous nature of this substance had long been suspected from its deleterious effects upon the poor, who were accustomed to the use of rye-corn as a daily diet, and who frequently made use of the spurred corn without being aware of its qualities. In 1807, Dr. Stearns, of New-York, discovered and reported the peculiar properties of the diseased corn, and it shortly afterwards came into frequent use, both as an emmenagogue in cases where the catamenia were interrupted from a want of uterine action, and as a ready means of expelling the fetus or placenta in lingering labours. The specific action of ergot upon the gravid uterus has occasionally rendered it the instrument of crime by procuring abortion; and an extreme dose has not only effected this purpose, but resulted in the death of the mother.

Medical Use, &c. Ergot readily parts with its active principle to water; and it may therefore be given in the form of infusion, in the proportion of half a drachm to a drachm in two ounces of boiling water, allowing it to soak for half an hour; of this half the quantity may be given, and the remainder an hour afterwards if no extraordinary action of the uterus take place. Should the ergot be preferred in substance, it may be finely pulverised, and administered in doses of ten grains, every ten minutes, until its effects are apparent.

When prescribed as an emmenagogue, the doses may be varied according to the age and condition of the patient; from a drachm every day, the quantity has been gradually increased to an ounce of the powdered ergot; and we have the testimony of several physicians, that, in affording relief to the most obstinate cases of amenorrhœa, which had resisted all other remedies, no ill effects resulted from the powerful action of this medicine when gradually increased to the ounce dose.

Symptoms when taken in excess. In those districts of country where this diseased grain has been employed as food, two very singular maladies appear to have been occasioned, both accurately described by Sauvages, the one as "necrosis ustilaginea," and the other as "erysipelas pestilens." The first of these diseases is a gangrene, "which commences without fever in the hands and feet, with a sense of numbness and external coldness; a dusky or livid cuticle; great debility of mind and body; often violent spasmodic contractions; and spreads rapidly over the system, till the fingers, arms, nose, legs or thighs, are affected, and some of them drop off spontaneously." (Morgagni.) The second disease is a typhus fever of malignant type, which quickly proves fatal. Where the ergot is taken in a sufficient quantity to prove directly poisonous, it occasions the following symptoms:—*Primary*—A sense of creeping or tingling over the whole surface, and excessive heat in the extremities; heart-burn, and pain in the stomach and bowels. *Secondary*—The pain increased to an excessive degree; vertigo; cramps in the limbs, and spasms in the regions of the heart and stomach; delirium soon sets in, followed by stupor; and, in the worst cases, violent convulsions precede dissolution. When the dose has not been sufficient to destroy life, the result is scarcely less lamentable, as a low and miserable mania succeeds to the more active demonstrations of the poison.

Cause of Death. Ergot operates upon the system in the same mode as the majority of vegetable poisons, by a determination to the heart, brain, or alimentary canal, through the circulation.

The *Morbid Appearances* are extremely uncertain; the positive marks of inflammation may be observed in the stomach and intestines, or the membranes of the brain present an appearance of increased vascularity; but we shall rarely discover sufficient signs of

a morbid action, to account for the intensity of the previous symptoms.

Treatment. The stomach should be immediately evacuated by a potent emetic, or by the use of the stomach-pump. If the symptoms of inflammation be intense, either in the intestinal canal or the brain, the lancet must be unsparingly employed, together with the use of fomentations and injections. In cases where appearances are not so alarming, the liberal use of opium is said to have been attended with the best effect in subduing the irritation into which the system has been thrown.

There is no *Test* capable of detecting the presence of this poison.

POISONOUS FISH.

Clupea Thryssa,	or	Yellow-billed Sprat.
Conger Muræna,	"	Conger Eel.
Coracinus Fuscus,	"	Grey Snapper.
Corophæna Splendens,	"	Dolphin.
Cyprinus Barbus,	"	Barbel, (of Europe.)
Opah,	"	King Fish.
Ostracion Glabellum,	"	Smooth Bottle Fish.
Perca Major,	"	Barracuta.
Perca Marina,	"	Rock Fish.
Scomber Thynnus,	"	Bonetta.
Tetrodon Scleratus,	"	Tunny.

The cancer mænās, or common crab, and the cancer gammarius, or lobster, are the principal varieties in the insect tribe employed as food, and capable of exercising deleterious effects. The mytilus edulis, or muscle, is, perhaps, the only edible species of vermes, or worms. The ill effects sometimes attributed to the muscle of Europe, are generally supposed to be occasioned, when a small tuft of moss, attached to the body of the worm, is swallowed through carelessness; and the symptoms produced, may rather be referred to those of oppression in consequence of the indigestible nature of the substance, than to any poisonous qualities it possesses; there are, however, some muscles, particularly in the East and West Indies, that, in common with some other marine animals, exercise an unfavourable influence upon the animal economy, produce the same symptoms, and terminate in the same result as the most poisonous of the fish tribe.

This list, then, comprises the common varieties of poisonous animals,

but many could probably be added to the number : the exact nature of their qualities is but little understood ; whether they reside in the whole carcase, or in some particular part of it, are introduced into the animal in the form of food, or are constantly retained, are occasioned by the spawning season, by any peculiar habits of the animal, or by its sickness ; and whether they depend upon the idiosyncrasy of the individual eating them for their operation, are all circumstances of remark, and of uncertainty in determination.

Fish and muscles of the most poisonous description appear to the eye as healthy and agreeable as the most wholesome varieties : chemistry will not lend any assistance in discovering their noxious properties, and out of a number of persons who may occasionally have eaten of the same dish, a few are found violently, some slightly, and others not at all affected. The process of carefully cleaning and salting, appears to abate the danger of eating some of the varieties above mentioned ; but even this precaution will not always ensure escape : it is then certain, that whatever poisonous qualities exist, they are greatly increased or diminished by the peculiar condition of the system generally, and of the digestive organs in particular, of those who partake of them. Crabs and lobsters, especially, will affect some persons at one time, and prove innocuous at another, even in the same season, and under similar circumstances in every respect. *The immediate symptoms* of disorder occasioned, are, great nausea, constriction of the throat, thirst, a sense of suffocation, and a burning heat on the whole surface of the body ; to these succeed diarrhœa, cold sweats, faintness, and spasmodic affections of the muscles ; efflorescence of the skin, and sometimes a miliary eruption ; in the worst cases the eyes become inflamed ; the wrist, ancle, and knee joints are visited with acute pains ; tenesmus and strangury ensue ; and the sufferer is almost beyond the power of art : these symptoms, of course, apply to the worst cases ; to such as are recorded in the annals of West Indian practice, in general the milder symptoms alone prevail, and are under the control of medicine. When death ensues, it would appear to be occasioned by an absorption of the poison through the circulation, and how actively it exerts itself through that medium is apparent from the symptoms occasioned ; an examination of the body after death displays the stomach and intestines in an inflamed state, with occasional patches of ulceration of the mucous membrane ; generally a quantity of dark, fœtid fluid in the stomach ; while the vessels and membranes of the brain present appearances, sometimes of intensely, but generally of slightly, increased vascularity. The most valuable remedies are, first, evacuants of the stomach and bowels, and then cordials and stimulants ; the use of ether, in drachm doses, frequently given in some simple fluid, may, perhaps, be preferred

The *Rationale* of this treatment is apparent.

There are no *Tests* by which this mode of poisoning can be detected.

ASPHYXIA.

Asphyxia is that condition of the system, when the action of the heart is suspended, and the arteries and brain have in consequence ceased to act. This state is occasioned by the operation of various causes, the principal of which are the following :

1. Submersion, or Drowning.
2. Suspension, or Hanging.
3. Inhalation of unrespirable Gases.
4. Cold.
5. Electricity.

1. **ASPHYXIA FROM SUBMERSION** arises immediately from suffocation, or a complete obstruction to the respiration, not as formerly supposed by an admission of water to the lungs, but from a spasm of the muscles of the glottis upon the approach of the fluid, and which closes its rima as completely against the entrance of air, as though a cord were tightened around the throat. The appearances of a person in a state of asphyxia from this cause, are extremely decisive ; the face is livid, and the superficial vessels turgid, and the limbs in a state of flaccidity ; if death succeed, the lungs are found gorged with blood, while the vessels of the brain are free from distention.

From the records of the London Humane Society, by whose assistance, and through whose agency, hundreds of individuals have been rescued from death, it appears, that if the body be recovered within five minutes after submersion, re-animation is comparatively easy ; after a quarter of an hour, extremely difficult, and when more than twenty minutes have elapsed, nearly hopeless.

Treatment. Under the impression that a considerable quantity of water had reached the lungs, the ancient practice consisted in subjecting the patient to a degree of roughness in his usage, that rather hastened his departure from the world, instead of recalling the faint spark of existence that remained. The unfortunate was rolled in a barrel, held up by the legs, and treated with violence totally unjustifiable. The spasm of the muscles of the glottis was not taken into consideration, which must not only prevent the entrance of fluid into the trachea, but also into the stomach by means of the œsophagus.

The sufferer should be conveyed, carefully and speedily, to the nearest house, and placed in a strong light, near a fire if the weather be cold, with the head and shoulders somewhat elevated ; the room

being cleared of all but the necessary assistants, five or six in number, the body should first be wiped dry, and then submitted to the following treatment :

Apply warm cloths, bladders or bottles filled with hot water, bags of heated sand, or hot bricks wrapped up in flannel, whichever may be the most convenient, to the stomach, soles of the feet, thighs, and axillæ ; rub the surface of the body with stimulants, such as the volatile ammonia, or spirits of turpentine, and bestow frequent friction with the hand upon the legs, thighs, and arms. Artificial respiration, however, presents the most valuable means of assistance ; if the proper apparatus for inflating the lungs be not at hand, a pair of common bellows, adroitly managed, will tolerably supply the deficiency, but from the difficulty of forcing the air down the larynx, by a tube introduced into the mouth, and the liability of its passage into the œsophagus, although pressure is made on the thyroid cartilage to close that cavity as much as possible, it is always advisable to introduce a silver tube (a catheter will answer the purpose) into the larynx, and attach it to the bellows ; a regular supply of air can thus be furnished to the lungs, closing the mouth and nostrils with the fingers, until the chest becomes inflated, when they may be removed, and the thorax pressed down as in the act of expiration ; this must be several times repeated, some of the assistants continuing the application of warmth to various parts of the body. An extraordinary difficulty may sometimes arise in the practice of artificial respiration, from fixity of the teeth, or strong contraction of the muscles of the jaw, rendering the introduction of a tube impossible, and in such case, the propriety of the operation of Bronchotomy must be immediately taken into consideration. The fauces and nostrils may be occasionally irritated by a feather, stimulating injections thrown up the rectum, and as soon as the patient can swallow, small quantities of warm wine or cordial administered ; if an electrifying machine can be quickly brought into action, a few shocks may be sent through the chest, and the warmbath may also prove a valuable auxiliary. With the first symptoms of returning animation, such as sighing, gasping, or a slight quivering of the limbs, every previous effort should be redoubled. Attempts at resuscitation must not be too hastily abandoned ; if four or six hours devotion to the cause of humanity be insufficient, employ ten, and you may be successful. When these exertions have been favourable, and animation is fairly re-established, the most perfect quiet is necessary ; a few hours afterwards a laxative enema may be given, and a slight quantity of light nourishing food supplied ; and should, as it is frequently the case, symptoms of counteraction appear, with slight fever and headache, it will be prudent to withdraw a few ounces of blood by the lancet or cupping, and to enforce the antiphlogistic regimen for a short time afterwards.

2. ASPHYXIA FROM SUSPENSION. The immediate cause is also

suffocation, from obstruction to the respiratory apparatus ; the face is livid and gorged with blood, the eyes protruded, and the nostrils swollen and spread : these appearances are especially remarkable, when the cord has been fixed in such a manner as only to close the larynx partially ; the agony of the sufferer being thereby greatly increased, and symptoms of apoplexy taking the place of those of asphyxia. In those instances where death has been instantaneous, from obstruction to inspiration solely, the appearances are not so evident, and from the simple circumstance, that the vessels of the brain, instead of being, as in the former case, overloaded, are proportionally free from sanguineous increase, while those of the lungs are greatly engorged.

Treatment. When the person of the sufferer corresponds with the condition firstly described, it may be proper, with an intent to his recovery, to abstract a small quantity of blood from the jugular vein or temporal artery ; but the greatest judgment is required both in a knowledge of the state demanding this loss, and in the quantity required, which should seldom, in the first instance, exceed eight or twelve ounces. It is sufficient to relieve the immediate oppression under which the vessels of the brain are labouring, and to reserve more copious evacuations for the stage of re-action, which is certain to succeed. When it may be presumed from the expression of the countenance, that the state of the lungs opposes the chief obstacle to returning animation, the mode directed in asphyxia from submersion may be adopted, and every possible exertion employed in again forcing respiration into action.

In the event of death after submersion or suspension, the attention of the medical jurist may be drawn to the circumstances under which either occurred ; whether occasioned by accident, self-determination, or through the criminal agency of others. The means of discrimination are, however, too frequently uncertain, and the closest investigation ends in doubt or unsatisfactory conclusion. When a body has been rescued from the water, the first duty of the physician is carefully to examine the surface ; if any wounds be observed, their nature, whether inflicted by a sharp or blunt weapon, by falling upon any interposing substance, such as a plank or boat, or by striking against stones, &c. on the bottom, will be all topics of consideration ; should the injury evidently have been occasioned by a weapon, the position of the sufferer, at the moment of its reception, may in a great measure be ascertained ; whilst the description of the deadly instrument can probably be learnt from the shape and extent of the wound.

Such are the principal circumstances to which the attention may be directed, ; and, as there are some instances on record (the body not being too much disfigured by the process of decomposition,) where they have led to the detection of the murderer, they are, not-

withstanding the doubt attendant on such examinations, highly deserving of notice.

With regard to the examination of individuals who have perished by suspension, there are few examples that can be traced to any other design but that of suicide, of course excepting the fate of malefactors. A recent trial in France has exhibited some remarkable details relative to the death of the Duke of Bourbon, in which a mass of evidence was produced to prove that he had fallen a victim to the designs of others, rather than to his own fears upon the occurrence of the Revolution, and which, as generally asserted, had operated upon him so far as to prompt his self-destruction. From the infirmity of the Prince, and more especially from a disabled hand, from the situation of the furniture in the apartment, and the disposal of his dress, it was not only assumed that he was incapable of accomplishing the object attributed to him, but that considerable violence had been exerted in suspending him from the post of the bed. The trial, however, terminated by the Court declaring the charges unproved, and by confirming the testamentary disposition of the Duke in favour of his supposed murderers. The same enquiries made under the circumstances narrated, may be legitimately repeated on future occasions, when any suspicion is directed towards a second party, although from the necessary vagueness of the charge, it will ever be difficult to elicit sufficient data, from which a correct chain of evidence may be extended.

The mental condition of the individual, for some time previous to his disease, should always be accurately investigated ; it may supply us with a cause for the commission of a desperate act, however irrational the mind that could prompt it, and relieve the innocent from suspicion. The circumstances of the deceased, his domestic relations, and, in fact, every thing concerning his habits and associates should likewise be ascertained, as well with the view of detecting guilt as of warding off reproach from those who may have been unjustly accused of his murder.

3. **ASPHYXIA FROM UNRESPIRABLE GASES.** A great number of the gases are destructive to life ; some when breathed in a very small proportion, and others only when inhaled to excess. The following are the varieties to which man is principally exposed :

1. *Carbonic Acid Gas*, (called, by the miners, Choke-damp.)
1. *Sulphureted Hydrogen Gas*.
3. *Carbureted Hydrogen Gas* (or the Fire-damp of Miners.)

1. *Carbonic Acid Gas* forms nearly one half the weight of marble, limestone, chalk, and the calcareous earths ; it is likewise the principal product of the combustion of coals, wood, oils, and all kinds of carbonaceous matter ; is formed during respiration from the

combination of oxygen of the air with the carbon of the blood, and is contained in many mineral waters. During fermentation, it is liberated in large quantities, and also prevails at the bottom of coal mines, pits, old wells, caverns,* and the large vats used in brewing or dying. Its specific gravity is 1.5230, which accounts for its presence at the bottom of these situations. When it is intended to examine any places where it is supposed this gas exists, a burning candle should be attached to a cord and allowed to descend; if the light be extinguished, it is unsafe, as the same air that cannot support combustion, is incapable of supporting respiration. The readiest means of clearing a well or vat from this deleterious vapour, is by throwing down a considerable quantity of water, by which the gas is displaced, and gradually dispersed in the atmosphere above.

Injurious as carbonic acid gas is to animal life, when breathed, it yet retards the putrefaction of animal substances: this may be proved by suspending two pieces of flesh, the one in common air, the other in carbonic acid gas; the latter will be preserved untainted some time after the other has yielded to the putrefactive process.

2. *Sulphureted Hydrogen Gas* is liberated from stagnant pools, ditches, privies, sewers, and other places filled with decayed animal or vegetable matter. Its smell is extremely fœtid, somewhat resembling that of stale eggs, and it exerts a most deleterious effect upon animal life. Thenard, in a series of experiments, discovered that a horse could not exist in an atmosphere containing $\frac{1}{256}$ part of this gas, while dogs and other small animals expired in air which contained from $\frac{1}{800}$ to $\frac{1}{1500}$ of its volume of it. Chaussier, in pursuing this subject, ascertained that animals were killed by this gas even when it was kept in contact with their bodies for some time, although they were permitted to breathe in a pure atmosphere.

Sulphureted hydrogen is inflammable, burning either silently or with an explosion, according to its union with oxygen or atmospheric air. According to Sir Humphrey Davy, it consists of 93.8 parts of sulphur, and 6.2 of hydrogen, and is of the specific gravity of 1.124.

3. *Carbureted Hydrogen Gas*, or *Fire-damp*, is disengaged from stagnant pools or depositories of filth, and also yielded from the distillation of coal. The fire-damp of coal mines, by which such a waste of life has been occasioned, is nearly identical with the light carbureted hydrogen (so called from its inferior specific gravity) liberated from stagnant water. It is not productive of asphyxia, as

* In the celebrated Grotto del Cane, a cavern near Naples, the carbonic acid gas rises only one or two feet above the floor, and, in consequence, the visitors are not affected; upon the introduction, however, of a dog into the cavern, the activity of the poisonous atmosphere is at once manifested; the animal is thrown into a state of insensibility, from which it is recovered by being plunged into the neighbouring lake d'Agnano, in order to exhibit the same experiments to succeeding travellers.

it is readily explosive upon admixture with the atmosphere, in the proportion of one part of the gas with seven or eight of common air. When pure, it has neither smell nor taste,* and is of the specific gravity 0.55. According to Dr. Thomsom, it consists of 85 parts of carbon and 15 of hydrogen.

The frequent calamities that had occurred in the coal mines of England, by the explosion of this gas, from its contact with the candles of the workmen, led the late philosophic and benevolent Sir H. Davy, to institute a series of experiments for the discovery of some mode by which they might be prevented. This was at length accomplished by the use of air-tight lanterns, supplied with air through tubes or canals of small diameter, or through apertures covered with wire-gauze below the flame, and having a chimney at the upper part for carrying off the foul air. The apparatus was afterwards simplified by surrounding the flame of a lamp or a candle with a cylindrical wire sieve, having at least 625 apertures in a square inch. Within this cylinder, when the fire-damp encompassing it, is to air as 1 to 12, the flame of the wick is seen surrounded by the feeble blue flame of the gas. When the proportion is as 1 to 5, 6, or 7, the cylinder is filled with the flame of the fire-damp; but, though the wire-gauze becomes red hot, the exterior air, even when explosive, is not kindled. The lamp is therefore *safe* in the most dangerous atmospheres, and has been used most extensively in the coal districts of England without the occurrence of an accident. The effect of this safety-lamp depends upon the cooling agency of the fire-gauze, exerted on the portion of gas burning within the cylinder. Hence a lamp may be secure when there is no current of an explosive mixture to occasion its being strongly heated; and yet not safe when the current passes through it with great rapidity; but any atmosphere, however explosive, may be rendered harmless by increasing the cooling surface, either by diminishing the size of the apparatus, or by increasing their depth, both of which are perfectly within the power of the manufacturer of the wire-gauze. (Henry.)

Treatment, &c. In cases of asphyxia from the effects of any of these gases, the immediate attack is made upon the sensibility of the nervous system, the circulatory and respiratory powers being secondarily influenced. A degree of pallor is generally remarked in the countenance, unless where the respiratory function has only been partially arrested, in which instance the effects upon the circulation are visible in a tendency to apoplexy, and the usual symptoms of that affection are manifested. The sufferer should immediately be exposed to a free current of air, and cold water may be repeatedly

* The disagreeable odour arising from coal gas, is caused by the presence of sulphureted hydrogen.

dashed over the spinal and lumbar regions ; strong vinegar or liquid ammonia be applied to the nostrils, grateful acids and small portions of wine or cordial introduced into the stomach, employing the stomach-pump if necessary ; stimulating enemata administered, and the whole plan for re-establishing respiration, as recommended under the head of asphyxia from submersion, be brought into play. If an electric apparatus can be brought into immediate operation, shocks of moderate force may, with great propriety, be transmitted from the side of the neck, in the situation of the phrenic nerve, to the seat of the diaphragm, repeating them at intervals of a quarter of an hour.

Unless the signs of apoplexy be unequivocal, the use of the lancet is scarcely justifiable. Life hangs upon a slender thread, which the slightest violence or error in treatment will snap, as in asphyxia from other causes, the exertions for recovery must not be too quickly abandoned ; an extra hour devoted to the patient has often succeeded, when all probability of success appeared at an end.

In an accident from fire-damp, life is generally terminated at the moment of its occurrence by the force of the explosion, or by the injury received by fragments of coal broken from the mass ; when life is not extinct, the necessary treatment is sufficiently obvious ; as an addition to the means already recommended, surgical aid will in all probability be required.

ASPHYXIA FROM COLD, is occasioned by torpor, and an exhaustion of the physical power, by the sudden abstraction of heat ; the countenance is pale and contracted ; the limbs rigid and unyielding ; the patient insensible, and apparently under the influence of deep sleep. In the employment of remedies, great care is necessary : where partial asphyxia has taken place, and the extremities are the chief sufferers, as in the common instance of frost-bitten limbs, the body should be plunged into cold water (sea-water is, perhaps, preferable if it can be procured,) or rubbed with snow, and then well dried, and gentle friction, gradually increased, exercised upon its surface, at the same time introducing small quantities of warm wine into the stomach, and stimulating the rectum by an enema ; the same plan may be pursued in more severe cases, where the effects of cold have not been confined to the extremities, carefully avoiding any sudden measures by which warmth would be too quickly restored ; too much care, indeed, cannot be exercised in this particular ; the injudicious kindness of friends has too frequently led to a fatal error, and gangrene and loss of life succeeded to their well-meant, but ill-employed, exertions.

ELECTRICAL ASPHYXIA, is produced by an instantaneous shock to the nervous system, sufficiently strong to overcome its energy ; the countenance is pale, the limbs flexible, and, if life be extinct, the muscles will be found flabby and of a bloodless hue, and the blood uncoagulated ; the appearance of the passage of the lightning is sometimes visible in the form of dark blotches or streaks, or pre-

senting an appearance somewhat similar to the marks occasioned by a charge of small shot. Stimulants of an active nature must at once be resorted to, where any appearance of life remains, in the form of cordials, camphor, ammonia, &c. to the stomach, and spirits of turpentine as an enema. It is necessary to notice the strange opinion, that electricity is an agent of wonderful power in this variety of asphyxia, as a counter-irritant, passing the shocks in the same manner as directed in asphyxia from unrespirable gases: if this opinion be correct, it affords a singular instance of the destructive and saving ability of this mighty force.

The cases of asphyxia from the irrespirable gases, from cold, and the effects of electric power, do not afford much opportunity of investigation to the medical jurist. It is scarcely possible to conceive that life can be destroyed by a designed exposure of an individual to these agents, although a question may occasionally arise as to the course of death upon the discovery of a body at the bottom of mines, pits, &c. An example may be given of this probability, by recording a circumstance that took place in Upper Saxony many years ago. The body of a workman was found in an old well near Dresden, in which the water had nearly disappeared for a considerable period; three or four men, who descended for the purpose of bringing up the body, were successively affected by a mephitic vapour, and were with difficulty drawn up in time to save their lives. After purifying the atmosphere, the body was at length brought to the surface, and, upon an attentive examination, not the slightest injury, beyond a few insignificant bruises, was apparent: circumstances, however, occurred to attach suspicion to a fellow-workman of the deceased, who underwent many examinations, and was presumed by the public to be guilty of the murder of his friend. During the investigation, it was at length ascertained that the deceased had partaken very freely of liquor on the evening of his disappearance, and this, in addition to an alibi proven on the part of the accused, led to the final conclusion, that he had accidentally fallen into the well, where the foul air, or the carbonic acid gas, had sufficed for his destruction.

This narration may, perhaps, lead to the beneficial exercise of caution in pronouncing upon the cause of death, where an individual is discovered in a situation where he would be exposed to the action of a deleterious atmosphere. The body must be carefully examined, and the slightest wound accounted for, in the mind of the physician. If the well or other excavation be deep, injuries may be of a formidable character from blows received on the sides or at the bottom; and these may generally be distinguished from violence inflicted either by a sharp or a blunt instrument, with sufficient readiness.

With respect to cold and electric asphyxia, there can be no reasons for supposing that death has occurred through the instrumen-

talities of others, except in the case of exposure of children ; here the evidence is tolerably conclusive, as will appear in the second part of this work, when the subject of Infanticide is considered.

These considerations conclude that portion of the study of Medical Jurisprudence, comprising " Poisons and Asphyxia." The former of these subjects has unquestionably a closer reference to enquiries into the causes of death than the latter, and hence a larger space has been afforded : but the propriety of including Asphyxia in a work of this character will be admitted by all, when it is understood how many topics of serious reflection it presents. If the life of man be of value to his fellow-beings, either in a moral or social point of view, every question relating to its disposal claims the closest investigation ; and it is on this account that deaths by Asphyxia have been placed within the province of the medical jurist for examination, as well as those which are rendered more evident from the direct action of Poison.

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ERRATA.

Page 18, line 14—for “arsenide of arsenic,” read “arsenide of copper.”

Page 19, line 5—for “sulphate of potass,” read “sulphate of copper.”





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